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NEBULA TO MAN

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BY

HENRY R. KNIPE

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WITH ILLUSTRATIONS BY

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PREFACE

NEBULA TO MAN is an attempt to present a sketch of the evolution of the Earth on the Nebular Hypothesis; to note also subsequent sea and land movements, and successive appearances of life, as revealed by the geological strata. The geological record of past life remains very imperfect; still many additions, notably from strata in Egypt and North America, have been made to it in recent years; and, studied in the light of the doctrine of Evolution, its revelations have become much more intelligible.

To attempt a work of this kind in rhyme is, I know, a bold experiment. But, however severely scientific in some of its aspects, the story of Geology is truly the most enchanting story in the world; and rhyme may well be regarded as an appropriate form in which to present it. Indeed it is a fit theme for presentation in a much higher form than this; and we may well hope that some day it will be taken in hand by some great poetic genius.

My friend, the Rev. H. N. Hutchinson (author of *Extinct Monsters*, *Creatures of Other Days*, etc.) kindly read through my manuscript; and I gained the benefit of his wide scientific knowledge, in many useful criticisms and suggestions. Mr Hutchinson also rendered me much assistance in working out restorations of extinct animals.

PREFACE

The Council of the Royal Astronomical Society, the authorities of the Lick Observatory, California, U.S.A., and the authorities of the Yerkes Observatory, Wisconsin, U.S.A., kindly gave me permission to reproduce photographs published by them.

Dr Arthur Smith Woodward, F.R.S., Keeper of Geology at the British Museum (Natural History), examined many of the rough sketches and finished drawings made for this book, and favoured me with some useful suggestions for which I feel very grateful. Dr Smith Woodward also kindly gave me leave to reproduce restorations made by him of ancient fishes.

Dr C. W. Andrews, of the British Museum (Natural History), in the kindest way gave Miss Alice Woodward the benefit of his valuable advice in her drawings of *Pteranodon*, *Mæritherium*, *Palæomastodon*, *Arsinoitherium*, *Tetrabelodon*, and *Diprotodon*.

Baron Nopcsa, who has made a special study of *Polacanthus*, gave Miss Woodward some valuable help in her drawing of that curious dinosaur. Dr W. J. Holland, Director of the Carnegie Museum at Pittsburg, U.S.A., very kindly helped her with some particulars for the drawing of *Diplodocus Carnegiei*. And in her pictures of marine life she had the great benefit of the well-informed advice of her father, Dr Henry Woodward, F.R.S., author of monographs on "Crustacea" in the *Encyclopædia Britannica*, and of numerous articles on "Crustacea" and "Fossil Insecta" in the *Quarterly*

Journal of the Geological Society and *Geological Magazine*; and who for many years was Keeper of Geology at the Natural History Museum.

I am very grateful to Dr Ramsay H. Traquair, F.R.S., Keeper of the Natural History Collections in the Edinburgh Museum of Science and Art, for permission to reproduce restorations made by him of Palæozoic fishes.

Mr Henry Fairfield Osborn, Da Costa Professor of Zoology in Columbia University, and Curator in the American Museum of Natural History, most kindly gave me permission to avail myself of restorations, made under his direction by Mr Charles R. Knight, of some remarkable fossil remains found in strata of North America. I also gladly make my acknowledgments to the authorities of the American Museum of Natural History, to whom the admirable drawings made by Mr Knight belong. By this permission Mr Smit has been able to profit greatly in his drawings of *Naosaurus*, *Lælaps*, *Hadrosaurus*, *Patriofelis*, *Mesonyx*, *Tinoceras*, *Metamynodon*, *Elotherium*, and *Protoceras*.

Mr W. L. H. Duckworth, Cambridge University Lecturer in Physical Anthropology, kindly favoured me with some suggestions for the picture representing early palæolithic men. The materials for restoring primeval men are unfortunately very scanty.

Pithecanthropus has been restored from very imperfect remains. There is still some controversy as to the position

of this creature amongst the Primates; but many good authorities regard him as "the missing link."

For the drawings of ancient plant life I am chie indebted to the works of Sir J. William Dawson, Professor Heer, Le Comte de Saporta, and Professor Melchior Neumayr.

Messrs Macmillan & Company very kindly gave me leave to reproduce some figures illustrating Cell Developments from Mr T. Jeffery Parker's *Elementary Biology*.

All the drawings have been specially made for this book; and I wish to record my gratitude to the artists who undertook them. Mr Bucknall, Mr Charlton, Mr Smit—long known for his excellent drawings of animal life, both living and extinct—Mr Speed, Mr Whymper and Miss Alice Woodward have, I think it will be acknowledged, done their part with signal ability and success; indeed as though they had looked, with their own eyes, upon the life and scenes which they so well portray. Whilst Mr Wilson, fresh from his travels in "The Discovery" in Antarctic regions, has given us what must be a true picture of a large part of the surface of the earth during the great Glacial times.

The scientific names of various forms of life, referred to in the text, will be found for the most part in the Notes. I have also appended a list of the principal books to which I feel particularly indebted; many other works, however, have been consulted.

H. R. K.

June 1905.

TO NATURE

How fair, O Nature, are thy looks
In these thy matron days:
And with what light a heart thou seem'st
To tread thy thorny ways.
Man sees thee joying in thy life,
So full, so fresh, so free,
As if thy toil in ages past
Had nothing been to thee.
And well may he, beneath thy spell,
Forget thy inner life,
The waste and suffering in thy breast,
And never-ceasing strife.
Or if so be he needs must think
Of all the tumult there,
He knows at least one end it has,—
To make thee grow more fair.

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GREAT NEBULA IN ORION

Yerkes Observatory, Wisconsin, U.S.A.

(Royal Astronomical Series, No. 96)

To face page 1

NEBULA TO MAN

PRE-PALÆOZOIC AGES

A GLOWING mist, through realms of space unbounded,
Whirls on its way, by starry hosts surrounded.
Dim is its lustre, as compared with theirs,
And more the look of stars dissolved it wears.
Volumes of heat, from its prodigious stores,
To endless space, it never ceasing pours.
Formless and void it seems, and yet it holds
A coming world within its hazy folds.
A sun lies spread within its depths and heights ;
Planets are there, and all their satellites.
But still as yet they lie confused and blent,
Like starry dust, lost in the firmament.

Have some old burnt-out stars, once big and bright,
Recovered by collision heat and light?
Have some old worlds, that long at rest had lain,
Been rudely roused to run a course again ?

* * * * * * * *

Now has the mist, from constant loss of heat,
Less vague and tenuous grown. Contractions great
Have changed its aspect. In the central part
Particles close drawn have formed a heart :
And in outlying regions, here and there,
Some cores, less big, of clustered haze appear.

* * * * * * * *

Still from the mass the fervent heat outflows,
And on and on the condensation goes,
As slowly all the rallying cores enlist
More portions of the still free floating mist.
Whilst in their vast electrical contents
Are being evolved the chemic elements.

* * * * * * * *

Now loom with large proportions in the maze
The various cores of close collected haze.
But far supreme a central nucleus rides,
With monster shares attracted to its sides.
And there it glows a giant on the scene,
King of the mist, with fierce and sun-like mien.

* * * * * * * *

More change of form the cloudy mass displays,
As rallying points the more collect the haze.
And outlying cores now move in space more clear,
And seem as though left free to wander there :

SPIRAL NEBULA IN CANES VENATICI.

LICK OBSERVATORY, CALIFORNIA.

ROYAL ASTRONOMICAL SERIES No. 70.

To face page 2.

But subject are they held, and forced to beat
In ceaseless circuits round the central heat.

More planet cores lie now without the fold
But round the central heat their orbits hold :
And ever will the mist, though changed it be
In state and form, preserve a unity.

* * * * * * *

Loosed now are all the planets on their ways ;
Each with its burden of collected haze
To run a destined course : and left alone
Spins the main core, a glowing central sun.

Thus sprung from fiery mist, condensed and rent,
Another star burns in the firmament ;
And with its glowing planets whirls along,
An added glory to the heavenly throng.

There moves our planet, sun-held as the rest,—
Our mother Earth ; but on her molten breast
No life as yet can dwell ; and should the clouds,
That gird her round with wind-swept vapour shrouds,
Condense and pour their rains, no solid floor
Has she as yet on which to hold their store.

* * * * * * * *

Cooling she ever is ; needs must she cast
A heat to frigid space, as in the past
Did the whole glowing mist. But through the heat
Now long outpoured, less fierce her vapours beat :

And matter here and there is forced to press
From gas to liquid state, and solidness.

* * * * * * * *

From long resistance to her swift career,
Now spins the Earth with outline of a sphere
With flattened poles ; but from her glowing zone
A molten core—her moon to be—has gone :
And destined though it be to further flight,
It will remain her constant satellite.

* * * * * * * *

Great is the uproar in the Earth's contents,
As change their states the chemic elements :
And groups, that oft a solidness attain,
Are driven to their former states again ;
And nothing there quiescent can remain.

* * * * * * * *

As lower still the fervent heat declines,
In sundry parts about Earth's wild confines
Some masses, cooled and solid, slowly lay
A crusty covering o'er the molten fray.

* * * * * * * *

Now has the struggling crust attained at length
A measure of stability and strength ;
And trembling lies, marked o'er with gaseous trails,
And shrunk to humps and hollows, hills and vales.

* * * * * * * *

Now can the surface, thickened, well retain
The torrent showers of long-suspended rain,
Which from condensing clouds are falling fast,
And flooding far and wide the crusty waste.
And on and on the water slowly gains,
The hollows hiding, and the lower plains.
But chiefly in the southern hemisphere,
Where lies the crust more deeply sunk, appear
The vaster volumed floods: for in the north
Stretches of land, high thrust, are standing forth:
And, 'mid the risings of the turbid sea
That steams around, retain their mastery.

Thus from a vague, diffused, and glimmering haze,
That hung a chaos in the realms of space,
A core, detached, in time has come to be
A shapely orb, endowed with land and sea.
The world is made; and a wild world it is;
A world of land-breadths, crumpled, verdureless;
A world of heavy mists and fume and steam,
Through which the sun-rays vainly strive to gleam;
A world of restless, turbid, steaming seas;
A world of hissing, roaring revelries;
A world of sea and land at constant strife;
A world whose heat forbids the rise of life.

But though the desert valleys, hills, and plains
Are worn and torn by winds and torrent rains ;
And grim volcanoes from their bellowing jaws
Belch forth, mid fume and flame, their molten stores ;
And cleft and wasted rocks about are thrust
By constant movements of the shrinking crust ;
And here upheavals come, depressions there ;
And sea and land join issue everywhere ;
Still through the mell a movement onward goes
That tends to order, union, and repose :
All, all is progress ;—progress day by day
To wondrous scenes that still lie far away.

* * * * * * * *

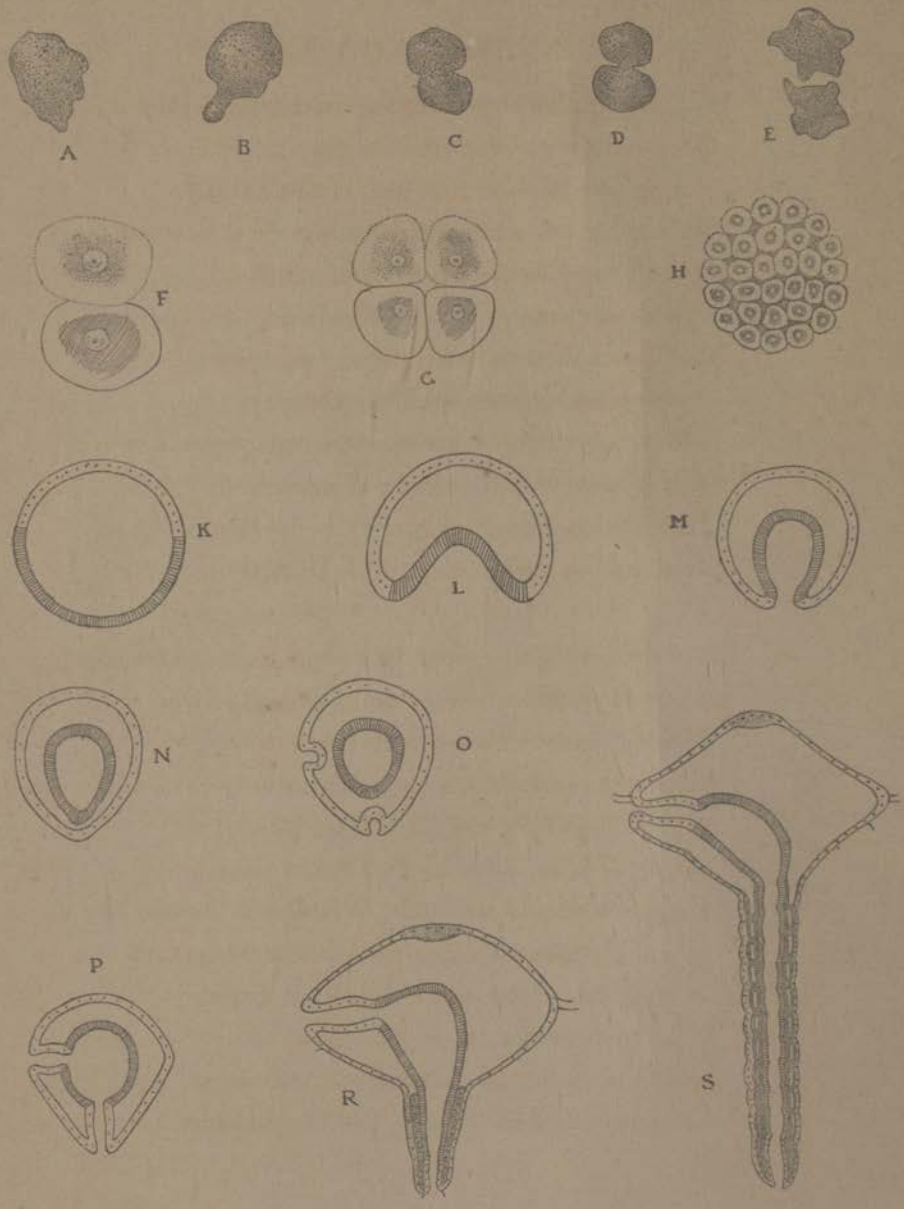
Streams, fed by ample rains, with leaps and bounds
Are running fast across the cooler grounds,
Wearing persistent ways 'twixt rocky walls,
Rollicking in rapids, jets, and waterfalls.
In hillside hollows, and the basined plains,
Tarns, lakes, and inland seas, filled by the rains,
Are glimmering in the sun. Whilst in the breeze
Loosed particles are borne from weathered surfaces
Of crumbling rocks, and with volcanoes' dust
Collect and form a soil or supercrust :
And beds are laid in sheltered vale and plain,
Where life to come some foothold may obtain.

* * * * * * * *

CELL DEVELOPMENTS

(Highly Magnified)

After Haeckel, and Parker



A, B, *PROTAMŒBA PRIMITIVA*, showing changes of form. C, D, E, in process of division. F, G, early stages of cells in union. H, *MORULA* stage. K, *BLASTOSPHERE* stage. L, M, N, O, *GASTRULA* stages. P, larva of *POLYGORDIUS NEAPOLITANUS* in Trocosphere stages. R, same in advanced Trocosphere stage. S, same in condition intermediate between the Trocosphere and the adult worm.

To face page 6

PRE-PALÆOZOIC AGES

The mightiest act this Earth has ever seen,
Ere since the sun first shone in the serene,
Now comes to pass. Where plays the cooler air
Some matter-specks, with life endowed, appear.
In mystic ways, some wondrous quickening Breath
Draws, as it breathes, Life to the face of Death.

Along the sunny coast-lines of the seas,
Away in creeks and bays and estuaries,
Minute life-forms arise, and from their birth
Move, though they know it not, the lords of Earth.

And if these specks be plant or animal,
What man can say? Perchance within each cell
In one life-form the two commingled dwell.
Still be they what, here thrive they 'mid the floods,
Sustained by water, air, and mineral foods.

Not only power to live do they enjoy,
But power to grow is theirs, and multiply.
A cell full nourished splits itself in twain,
And parts divided equal life retain,
And grow from halves to size of wholes again :
And these again have power to subdivide ;
And thus, by subdivision multiplied,
Soon countless swarms in surging myriads press,
Wherever fit conditions give access.

Throughout its frame promiscuously are done
The various functions of each little one.
No organs in their structures are devised—
Organs to separate labours specialised :
But each through every portion of its mass
Can eat and drink and waste material pass.

Simple indeed these specks of life appear,
Yet what a wondrous power has risen here!
And though they will advance, in times to be,
To higher states of vast complexity ;
Still here in these first forms enshrined there lies
The germ of all the life that will arise.

Not down to rigid lines are they fast bound
'Mid elemental forces rife around.
Resource is theirs to vary with the times,
And rise responsive to the fickle climes,
And mutable conditions of the vast
Transforming world, in which their lot is cast.

* * * * * * *

'Mid change and stress, the motive powers of Fate,
Live now some cells, no longer isolate ;
But keep, as they enlarge and multiply,
With offshoot cells a bond and sympathy.
And in the cells that thus together hold
Are all the hopes of higher life inrolled.

As fast within their fold the cells increase,
To new formations are they forced to pass,

Until as tiny sac appears their sphere,
Close bound by cells disposed in single layer.
Changes, within and out, slow come to pass
As cells, begetting cells, swell out the mass.
And by persistent pressure overborne,
Now is the sphere, at one part, inward drawn :
And with its cells thus brought to double layers,
The tiny mass a crescent aspect wears.
Then draw the crescent horns together near,
And by degrees enclose the indrawn layer ;
And little ducts are slowly formed between
The outer cells and those that lie within.
Of social cells wide changed is now the state
From that of cells, still living isolate.
No longer does each cell through all its mass
Alike eat, drink, and waste material pass.
United, corporate life is now the goal ;
And labour is divided through the whole.
Each gives up something, and with greater zeal
Promotes, in special ways, the common weal.
The outer layer takes up the w rk without,
Protects the mass, throws cells as feelers out,
And seizes food ; whilst in the inner one
The work of dealing with the food is done.
And slow about the life-mass are devised
Organs to separate functions specialised.

Masses with double layers some forms remain,
And ne'er to higher unities attain ;
And these thus left will never higher rise
Than Sponges, Hydras, and their near allies.

* * * * * * * *

Beneath the change and strain, at work around,
To higher life some forms their way have found ;
As now between their little double layers
A third, an outgrowth of the two, appears.
And in these forms, with triple layers arrayed,
A further move in complex life is made.

To do their duties to the growing mass,
To subtler states the outer layer cells pass.
As skin, nerves, muscles do they slow appear,
Sense-organs too are all within their sphere.
Upon the middle, new-formed layer, is thrown
The work of building up a skeleton ;
Within whose walls some cells will play their part,
And slowly lay the groundwork of a heart.
The while the cells within the inmost layer
In subtler ways the nutrient work will bear.

Thus, step by step, the infinitely small,
By union strengthened, rise to meet the call
To higher life : and power is theirs to rise
To greater heights, and grander destinies.

* * * * * * * *

Cambrian Period

To face p. 11

PALÆOZOIC AGE

CAMBRIAN PERIOD

TIME's close-drawn veil, now partly raised, displays
Nature—that never sleeps—well on her ways;
Spreading her life in regions far and wide,
In forms all humble, though diversified.
About the globe the ever restless sea
Retains o'er land its great supremacy.
Europa's grounds, that will in time appear,
Show but some heights as islands here and there.
And far to east the waters wander free
And join o'er Asia's wilds the eastern sea.
As yet lie hidden in the sea's domains
The whole extent of Afric's northern plains.
And land that will in time for Britain rise
For most part as a bed for shallows lies.
But neighbouring on its margins to the west
Some land, in time to sink, lifts up its breast.
And further west deep waters onward play
Till Canada's bleak shores obstruct their way:
But o'er Columbia's lands unchecked they run,
Save where some big lone isles bask in the sun.

Across the line another continent
In promise looms, as yet by waters rent
To numerous banks and isles. Still here and there
Some upheaved breadths of wide extent appear,
Where stretch to-day Brazil's great mountain chains
Of crumpled rock, and high and fruitful plains.
And through the world a warm soft climate rolls,
Whose genial airs reach even to the poles.
Forefathers of a great posterity,
Sea-weeds abound where shallow flows the sea.
Clinging to mud and rock sea-sponges grow,
Fed by the ocean-currents' ingathered flow.
Jelly-fish translucent are floating past,
With phosphorous gleaming through the watery waste.
Corals are here ; and fleshy graptolites—
Small trunks of life, with flower-like polypites.
Small box-like cystoids, clad in plates of lime,
And tiny stalked, are clinging to the slime.
Sea-worms innumerous swell the living band ;
Their burrows boring in the mud and sand.
And here and there, enclosed in double shells,
" Lamp-shells " are massed,—soft, wormy animals.
And other shelly worms are in the floods
Mussels resembling. Sea-snail gastropods
In cap-like shells are here : and some with feet
For swimming formed up to the surface beat ;

And in their dart-like shells float on the main ;
Seeking, when so they list, the depths again.
But life in higher forms is in the throng :
Leaf-footed shrimp forms crawl and swim along ;
Active with jointed limbs about the sand,
And sea-weed beds, that fringe the ocean strand.
Here too are living one-eyed water-fleas,
Shielded in shell against their enemies.
Soft-bodied creatures in vast multitudes,
Akin to King-crab forms, and Isopods,
Haunt too the muddy bottoms : some as small
As millet seeds, whilst other species crawl
Longer than lobsters. Some have eyesight keen,
Whilst others sightless wander o'er the scene.
With easy movement do they creep about
In shelly crusts, in three divisions wrought :
And wide will these mixed Trilobites extend,
Though destined be their vigorous race to end.
New forms of life are seen upon the stage
As onward roll the long years of the Age.
In rocky beds "Sea-lilies," cup-shaped, grow ;
Waving their arms in tidal ebb and flow.
About the shoals star-fishes, five-rayed, glide—
(Are these some primal worms together tied?)
In quiet depths below the ocean swells,
Predaceous Nautiloids, in long-coned shells,

Pursue with stalky eyes their hungry way,
Seeking small mollusk and crustacean prey ;
And rhizopods, in tiny latticed tests,
Oft fall as victims in their glutton feasts.
(Are these fierce Nautiloids, that wander wide,
Some primal worms to new forms modified?)
Strangely are Life and Death close mingled here,
As all around the strain grows more severe.
For not a creature lives beneath the sun
But has some dangers every day to run.
Still life is pleasant, be it short or long,
Alike to small and great, to weak and strong.
Thus through the brine life manifold proceeds,
Impelled to higher states by growing needs.
And all these early life-types in the seas
Will branch in time to many species ;
And some, amid conditions too severe,
Must, after stress and struggle, disappear.
And when a species falls from Life's domain
It never gains a place on Earth again.

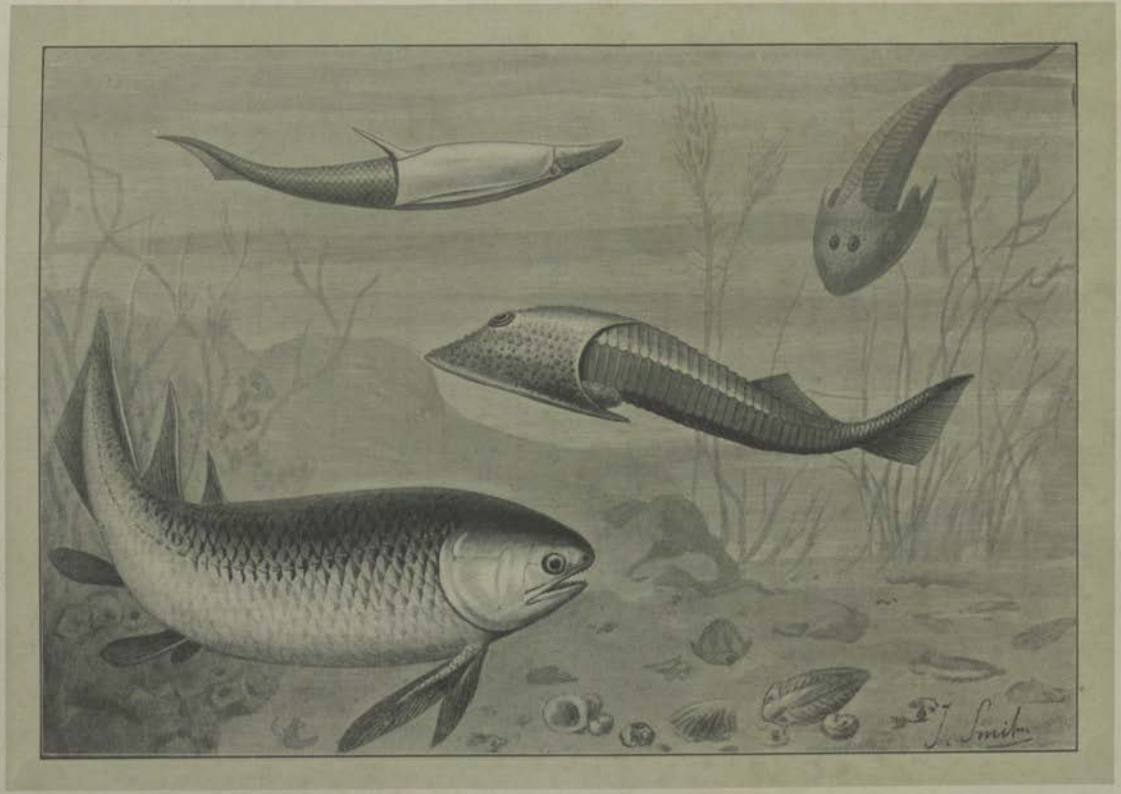
SILURIAN PERIOD.

To face page 15.

SILURIAN PERIOD

Now other layers of rock take up the tale,
And Nature's ceaseless industry unveil.
No pause she knows ; at rest she cannot stand,
Though vast may be the time at her command.
Not but she needs immeasurable time,
For step by step must she the ladder climb.
No "royal roads" are running through her spheres,
No power or gift of miracle are hers :
And though through Cambrian years she laboured long,
In humble forms still stands her living throng.
Along the shore sand-hoppers merry rise,
Romping about like swarms of dancing flies.
Water-fleas, swimming snails, and trilobites,
"Lamp-shells," cystoids, and fleshy graptolites
Are in their zenith now ; never again
O'er the wide world such glory to attain.
Corals are spreading through the clearer seas,
"Rugose" and "tabulate" of many species.
Crinoids, strong stalked and tufted, lift their heads
In jungled wealth about their briny beds.
And though developed animals they be,
Well are they named the "lilies" of the sea.

"Sea-urchin" creatures in a "hedgehog" skin
Now first appear about the briny scene.
Here too amid the life around that swarms,
Some brittle-stars are sprawling on their arms;
With locomotion seemingly a toil,
And glad are they round Coral forms to coil
For rest against the currents. Forms allied
To Barnacles are also in the tide.
Pearl-oyster looking creatures too are here.
Horse-mussel, Cockle, Scallop forms appear.
Some sword-tailed king-crabs seeking wormy food
Are raking with their nippers in the mud.
And Nautiloids are now about the sea,
Whose long cone shells are ended spirally.
Here too some early Ammonoids we find,
In coiled-up shells that well may call to mind
The horns of rams. (Hence gain they Ammon's name,—
The god with head of ram, and human frame.)
And from the Ammonoid ranks in time will rise,
In various forms, great mollusk families;
For which the Goniatites, already here
In simply twisted shells, the way prepare.
Sea-scorpions, pincer armed, with compound eyes
And shelly carapace, now exercise
A lordship where they live. For Nature's hand
Raises now this, now that class to command;



FISHES OF THE SILURIAN PERIOD

To face p. 16

And many a throne, in many a sea and clime,
Has she set up, and levelled in her time.
Within our range as yet the waters through,
Invertebrates alone have come in view :
Holding the scene through deep and shallow seas,
In classes, orders, genera, species.
But now backboneless life has ceased to be,
Wide though its ranks, sole tenant of the sea.
Creatures of sterner build are now abroad,
Whose bodies, furnished with a notochord,
Or with developed column vertebrate,
Proclaim Life risen to a higher state.
Whence came these fish-like creatures, who can say ?
Doubtless in forms of lower life there lay
The power to rise to this. Sea-squirts and worms
Perchance were first in front, or some such forms.
Still be what may their doubtful pedigree,
Creatures of fish-like build now swim the sea.
Small Ganoid forms, in bony armature,
(Allied, perchance, to Lampreys), wander here.
Furnished they are with plate-like looking scales,
Small single fins, and back-bone stiffened tails.
And some of higher form are in the tide,
Seeming to Birchir fishes close allied.
And creatures larger framed, with prickly skin,
Dog-fish and Shark like also haunt the scene.

And this finned, back-boned life now forms the van
Of Nature's march from one-celled mites to Man.
The sea seems ever young ; all free from trace
Of bygone trouble that has swept her face.
And though she oft be stirred by rushing wind,
Yet transient are the furrows left behind ;
Invulnerable she lies in every clime,
To all the waste and ravages of time.
Not so the land : an open field she lies
Whereon expend destructive agencies
Their vandal force : and she must ever bear
Upon her face the marks of wear and tear ;
And whilst her rival smiles with constant youth,
By art must she contrive to hide the truth.
Volcanoes, earthquakes, weather, rivers, rain
All havoc play upon the land's domain :
And seem at times as their design might be
To make her realms lie level with the sea.
Volcanoes pour in streams her inner rocks,
Through gaping fissures wrought by earthquake shocks :
And down to sea the steaming lava flows
Destruction carrying, as it rapid goes.
Proud standing rocks, submitted to the strain
Of varied climate, and dissolvent rain,
Crumble and crack, and from long wear and tear
Once massive brows as ragged crags appear :

And streams and rivers, brisk through vale and plain,
Bear down the surface wreckage to the main.
The sea herself joins with the vandal hosts,
Scooping out caves, and breaking down the coasts.
Whilst slowly here and there some lands subside,
And disappear beneath the advancing tide.
But compensation comes: the powers that be
Conspire for land as well as for the sea;
Or strange had been our planet's history;
And void of beast to walk and bird to fly
Our globe had spun as fish-bowl in the sky.
The sea that conquers here is beaten there,
As from the depths raised bottoms greet the air;
Slowly but surely through the billows thrust,
By pressure of the cooled and shrinking crust.
And spoils brought down by rivers to the shores,
And shot in layers upon the briny floors,
Thickened and hardened rise in time again
As solid grounds to mock the insatiate main.
And deltas, shoals, and bars of mud and sand
Their spoils all heap to compensate the land.
And though through inland scene, and by the shore,
Change and decay are ever to the fore;
Still does their action, ceaseless night and day,
For land's approaching glory pave the way.

Fire, water, air, heat, cold, relentless storms
Are moulding her to divers shapes and forms;
Giving her highlands, lowlands, hills and dales,
Plains, plateaus, gorges, glens, ravines and vales.
Rock debris lies amassed in sheltered nooks,
Hollows and dells; where rivers, streams and brooks—
Ceaseless transporters of the sand and clay
From weathered rocks—find not their wandering way.
But oft by rains assailed, and searching wind,
With little growth its particles to bind,
Slow is the hunted treasure stored away,
And long must Nature wait for her display.
Yet plant-life here and there is on the shores
In growths allied to those that strew the floors
Of shallow seas and lakes; and sombre green,
And other hues and shades, adorn the scene.
And nobler plants than simple cells combined—
Where leaf and stem are very ill defined—
Here lift their heads;—plants risen to a state,
Where stem and leaf are organs separate.
And just as early forms of animals
Slowly advanced by packing close their cells,
And found with corporate life came power to act
With different organs for the mass compact:
So also early forms of one-celled plants
By joining cell to cell made their advance;

Large Club-moss growths in distance

Brakes of *Annularia*

SILURIAN PERIOD

To face p. 21

And surface cells compressing formed a skin,
A shield and cover to the cells within :
And inner cells, in different parts, combined
Organs to form, each with its work assigned ;
Till root, and stem, and leaf distinct outstood,
Each with its functions for the whole plant's good.
Small liverworts perchance here took the lead,
And slowly graced the mountain and the mead.
And still a wondrous inner work went on,
Till cells compressed to vessel tissue won
A strength and power for the plant to rise,
And glory in a greater height and size ;
And fern-like plants, by fibrous folds upheld,
Proclaimed the progress of the leafy world.
In due time then the grander growths upstood,
With fibrous tissue thickened into wood.

Along Silurian weed-encumbered strands,
Lake margins, fluvial flats, and boggy lands,
Some fern-like rhizocarps are now in view,
With whorls of wedge-shaped leaves of sombre hue.
Club-moss-like growths, like little trees upstand,
Seeming the chiefs of leafy life on land.
And reedy growths are also thriving here,
Whose stems with rings of spiky leaves appear.
And many a wild, that in the past had been
O'errun with puny weeds, in wealth is seen.

Now is the mantled ground the happy home
Of busy insect life ;—where plant-lice roam,
And seek in stem and leaf their juicy foods,
And people leafy lairs with countless broods.
Here too cockchafer-looking creatures come,
And freely leaves and lice alike consume.
Scorpions, with near relations in the sea—
(The source and font of much land life to be)—
Are also here : and armed with claws and stings
Become with facile steps terrestrial kings.

But life on land pursues a chequered course,
As Law holds on its way, without remorse.
The shrinking crust to coast-lines oft brings change,
And land and sea their frontiers rearrange.
Here slowly rise breadths proud with hill and plain,
There others slowly sink beneath the main :
And vast and cherished growths their bosoms bear,
Though fair and full of promise, disappear.
Yet oft their higher grounds escape the fate
And stand as arks, charged with a precious freight.
But though in parts seems Nature's work undone ;
Yet through her realms does progress ever run.
And though her laws may all unchanging seem,
The Law of Progress is her law supreme.

Cladoselache.
(After Dean.)
(Varied from 2 to 5 feet in length.)

Tristichopterus.
(After Traquair.)

Eusthenopteron.
(After Whiteaves.)
(About $\frac{1}{4}$th natural size.)

Pterichthys.
(After Traquair.)

Phaneroplueron.
(After Traquair.)

FISHES OF THE DEVONIAN PERIOD.

To face page 23.

DEVONIAN PERIOD

But be the fortunes of the land what may,
Life in the waters can pursue its way
Less fraught with risk. And in its safer place
Onward is pressing fast the finny race.
The shielded Ganoids now swim far and wide
In sea and lake, in all their bucklered pride.
And in their armoured ranks new forms appear;
Amongst them some with massive cephalic gear;
As if the fight for life had grown intense,
And stouter shields were needed for defence.
In ranks unbucklered new forms too arise,
Amongst them creatures grown to giant size,
Whose massive jaws, with big sharp teeth a-rife,
Must send to instant death much humble life.
And in the increasing Ganoids' bright-scaled throng
Fishes akin to Sturgeon swim along.
Mud-fish-like looking forms, some huge in size,
Lurk here and there in swampy estuaries.
Unlike the Shark and Ganoid species,
A double means of breathing these possess;

Breathing through gills when in the tide they lie;
Through lungs when ebbing water leaves them dry.
From some old ganoid grandsire are they sprung,
Whose swimming bladder slowly turned to lung?
And are these double-breathers on the way
To found amphibian life of later day?
Though thickly swarm some finny groups around,
By checks and limitations are they bound.
Dog-fish and Shark-like creatures, numerous grown,
Play well their part, and keep the small fry down.
And many orders here would cease to be,
Had they not safety in fecundity.
Although of their superiors the prey,
The lower orders of the watery way
Crowd far and wide, in forms both new and old.
But some are losing fast their former hold.
The Trilobites' once large and varied hosts
Show signs of waning now along the coasts.
The box-like cystoids too are on the wane,
To bud-shaped blastoids yielding their domain,
Nor can the graptolites their place retain.
Conditions change; and those that cannot meet
The altered state are driven to retreat.
There is no standing still when comes the stress,
And those that make no headway retrogress.

DEVONIAN PERIOD

Pressure of population, fast increasing,
With all its strife and rivalry unceasing :
New forms of life, more vigorous on the stage,
Climatic changes, epidemics' rage,
Subsidence, uplift, scarcity of foods,
All bring their trials and vicissitudes ;
And strained and harried by the wear and tear
Whole groups of life are doomed to disappear.
But as, hard pressed, some droop and fade away,
Others advance and wield a wider sway.
The change around or brings them no distress,
Or better suits them ; or maybe they possess
Adaptive powers—are able to conform,
And bending are not broken by the storm.
Whilst other orders wane and die around,
Along the coasts the " lamp-shells " now abound :
And pregnant are these creatures with resource
That bodes long years ere they run out their course.
Some forms with wing-like shells now meet our eyes,
Seeming indeed as shelly butterflies.
And though their stock Etruscan-lamp-like be,
These scarce are " lamp-shells," save by courtesy.
Nautili are here, whose flattened spiral shells
Are loosely coiled, and bound with tubercles.
And though abroad old straight-shelled forms still stray,
These to their coiled allies seem giving way.

Of Ammonoids the smooth-shelled Goniatites
Are now in force ; and so named Clymenites,
Another family, now first are found,
In spiral shells with stripe-like pattern bound.
Sea-scorpions from good living now are grown
To giant size, and more than hold their own.
" Sea-lilies " boast new species in their throng,
Star-fishes more developed glide along.
New forms and types appear in Coral ranks,
And some are busy building reefs and banks.
Small Shrimp-like forms are darting to and fro
In sandy shoals, and high-tide overflow :
And lower life, in spite of stress and change,
Fills up its gaps, and widens out its range.

Whilst now the sea-weeds, spreading fast and free,
Deck with new forms the gardens of the sea ;
Rejoicing in the warm and humid airs
In greater wealth the verdant land appears.
On creeping stems the psilophyton spreads
Its crosiered branchlets o'er the marshy beds ;
The huge club-mosses now have wider hold
Of soil enriched by vegetable mould :
And from their fruitful cones wind-carried spores
Are bringing feature to the farthest moors.
The sigillaria, on boggy lands,
A tall leafed pillar, held by cord roots, stands.

FISHES OF THE DEVONIAN PERIOD.

(About $\frac{1}{8}$th natural size.)

DIPTERUS VALENCIENNESI.

(After Traquair.)

To face page 26

Along the flats, where rivulets are flowing,
Dense brakes of reedy calamites are growing.
True ferns in wild profusion now abound
In feathery pride. And graceful from the ground
Some rise as trees, and closely gathered stand
On favouring soils, as forests on the land.
And whilst, in time, club-mosses will decline,
And but as pigmies keep alive their line;
And calamites, from fast and wide advance,
Will dwindle into insignificance;
And other growths will wholly disappear,
Yielding their place to forms of life more fair;
Ferns—tree and shrub—their glory will retain
To grace the earth, and greet the eyes of men.
But newer growths than these now hold the place
Of prime exemplars of the leafy race:
For types ancestral of the Pines and Yews
Now vest the landscape with their sombre hues.
Although with fern and club-moss close allied,
True trees are they, of all the scene the pride:
And forest kings, wherever they intrude,
As up they stand on stems of thickened wood:
And with their puny flowers proclaim the rise
Of flowering plants amid the flowerless.
But heavy gases in the air prevail,
Too dense for fine formed plant life to inhale,

And no gay flowered growths as yet are here
To paint the scene, and scent the atmosphere.
    New forms amongst the insects now are flying,
To Nature's smiling overtures replying.
From watery chambers may-flies upward soar,
Joy one day in the light, and are no more.
Insects, gauze-winged, are flitting here and there ;
And some with chirrup notes envoice the air.
(The music maybe first in Nature heard,
Long ere the woods were waked with song of bird).
Amid the plants the sightless millepede
Now gropes along :—for not with reckless speed
Will blind life move, e'en though it may possess
"A thousand feet" with which its way to press.
In such-like humble forms—lords of the day—
O'er Earth's green breadths does Life pursue its way.
    Throughout the world to farthest east and west,
The crust, by cooling more and more compressed,
Brings frequent interchange of land and sea,
And to itself increased stability.
Lava and tuff from burning crater stores
Are now amassed on Scotia's rising shores.
(And well for life if there it does not rise
To higher forms than may and dragon flies).
But what is given here is taken there,
And land more north is forced to disappear.

Calamites *Sigillariæ*

Cordaite *Lepidodendra* (club-moss)

Stigmaria stump — Young *Sigillariæ*

DEVONIAN PERIOD

To face p. 27

Meanwhile great parts of Albion scale the sea,
And stretch their breadths to Belgia's territory,
And Francia's northern parts; whilst on the west
Their creeping shores to Erin's lands have pressed.
Thus up and down, as through the time to be,
With varied fortunes move the land and sea.
And goes not slowly on such change to-day,
As Earth to rest pursues her troubled way?

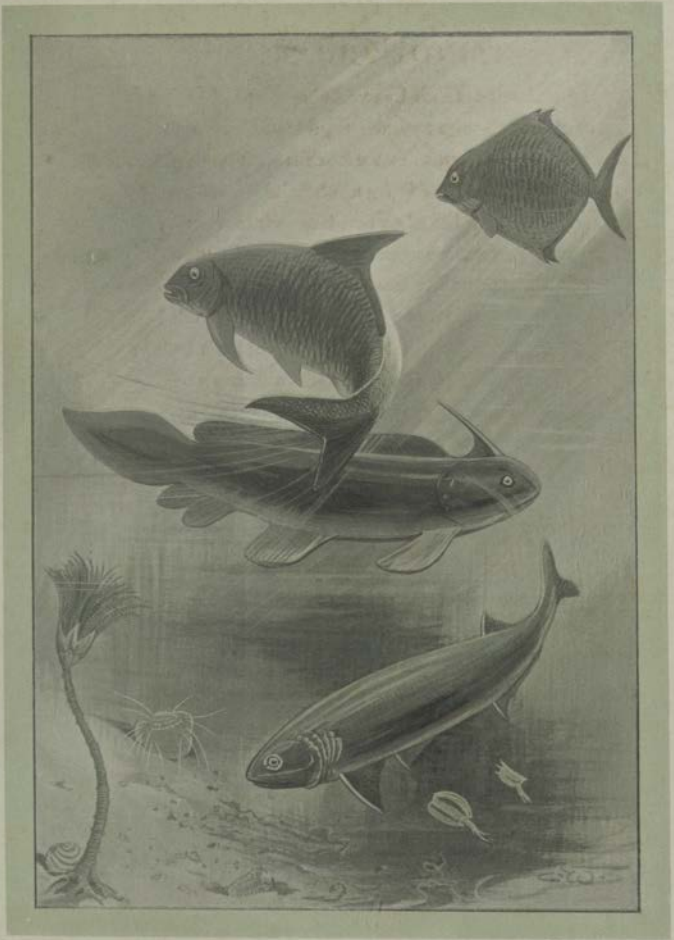
CARBONIFEROUS PERIOD

THEN as the years roll on, lands far and wide
Sink once again beneath the flowing tide;
And Albion's scenes that in Devonian days
Had hailed the sun become but water-ways;
With here and there some parts of the terrain
As banks and isles still masters of the main.
Erin, that had for long held up her breast
Above the waves, has also sunk to rest.
Scotia still holds her plateaus high and dry,
And east they stretch, continuous territory
With Scandinavia's elevated plains,
Big-rivered vales, and lofty mountain chains.
The while within the western hemisphere
New lands have scaled the ocean here and there.
Much can be done by numbers, though be small
The separate units that make up the all.
So now the rhizopods—some small as dust—
Their layers have spread upon the sea-floor crust;
And raised, with countless microscopic shells,
Vast limestone beds beneath the briny swells.

CARBONIFEROUS PERIOD

Now are "Sea-lilies" at their height of pride,
Vast areas holding in the flowing tide;
And with the kindred Blastoids, now thick swarming,
Pay constant tribute to the limestone forming.
And as high rise the slowly thickening stores,
Seas locked by land are shallowed to their shores.
And is not infant marble lying here,
Compacting close, and destined to appear
In polished pride in many a stately home,
And pillared fane, in times far off to come?
Molluskan groups, to goodly numbers grown,
Are haunting lands the sea now calls her own;
And mussels, whelks, and such-like find a home,
Where millepedes and scorpions used to roam.
Amongst the Ammonoids no more we see
The Clymenite Devonian family:
But grander shelled the Goniatites appear,
And at their highest fortune are they here.
The Nautiloid forms straight shelled, of earlier time,
Though still abroad, are now long past their prime;
And in the forms, in spiral shells enclosed,
The fortunes of the race are now reposed.
Though from the scene some families have fled,
In countless legions still the "Lamp-shells" spread;
Boasting some forms that have attained a size
As large as that their race will e'er comprise.

And forms are here whose shells with ample growth
Of long and hollow spines are bristling forth,
As they with better means had been supplied
To anchor fast, when harassed by the tide.
Still droop the Trilobites, and ne'er again
In size or structure will the race attain
To whilom pride. Indeed they fast decline,
And will ere long what place they hold resign.
The big sea-scorpions now are falling fast,
By nimbler forms of crusted life surpassed.
Large size in Nature is no guarantee
To those so blessed of long prosperity.
Small things do well: as see the water-fleas,
Now swarming thick in lakes and shallow seas.
And as with men a puissant state may close,
Wiped out by bloody wars with stronger foes;
Whilst some small state of far less worth perchance
Escapes such fate through insignificance;
So here these puny forms of crusted life
Hold on rejoicing 'mid surrounding strife;
And, snug and happy in their muddy delves,
Outlive much life far higher than themselves.
Still life moves ever on, though here and there
Some low forms thrive, and higher disappear.
And though the fierce sea-scorpions now have waned,
And move with faltering steps where once they reigned;



FISHES OF THE CARBONIFEROUS PERIOD.

(About $\frac{1}{3}$rd natural size.)

To face page 33.

Other related forms are sallying forth,
That by resource and might have proved their worth.
King-crab-like forms, that with the water-fleas
Throve in the shallows of Silurian seas,
Are forging on. And higher crusted life
Has now emerged from change, and stress, and strife.
The Shrimp-like forms that in Devonian days
Darted about the sandy lakes and bays
Abundant are; and these may prove to be
Of lobsters and the like the ancestry.
    Large Shark-like forms—Port Jackson sharks resembling—
With crushing teeth, push on their way through trembling
Ganoid and shelly life: where too some Ray
And Dog-fish looking creatures spread dismay.
And humble fishes by their foes made craven
Oft take to stream or lake as to a haven.
    Though pain and death indeed can never be
Divested wholly of their mystery;
In Nature yet they have a purpose clear:—
To force life on to every clime and sphere,
And make it in more noble forms appear.
And though comes trial to life, in every state,
The part it plays seems but subordinate.
    In many parts the Earth's contracting crust
Bulges again, forced by the press and thrust

Of weaker parts subsiding. Lands are lifted,
Large seas locked in, and ancient coast-lines shifted.
Big rivers from the rocky continents
Fast flowing bring down gritty sediments,
Worn from the weathered rocks of hills and moors,
To spread them on the limestone shallowed floors
Of seas enclosed. Truly with might and main
Labours the land her balance to retain.
And then, in time, as at a slackened rate
The rivers flow, their seaward débris freight
Perforce grows light. Coarse grit soon finds a bed,
But silts and shales are still borne far ahead :
And muddy banks, amassing by degrees,
Lift up their breasts above the shallowed seas.
    Life lies in wait, all ready to advance,
By sea and land, at every opening chance.
And muddy banks, new basking in the sun,
By leafy life ere long are overrun.
Soon creep the calamites upon the scene,
Hard though their struggle oftimes is, and keen,
On shifting treacherous beds to keep their hold :
(But Life is nothing if it is not bold).
And other growths the rising land befriend.
Club-mosses tall their frontier lines extend,
And sigillariæ. Ferns too break forth,
With cordaite shrubs, in tangled undergrowth.

Carboniferous Period

To face p. 35

And with thick jungled life wide scenes grow gay,
Where for long years the sea had held her sway.

On many a scene from farthest east to west
Now comes a time of long and great unrest ;
A time of ups and downs, of strange mutations
Of land and flood, with endless complications.
And breadths of land, that at low levels lie,
Pass through a strange amphibious history,
Amid conditions much as those to-day,
Where mangrove swamps their jungled growths display.

Great belts of shore nigh level with the sea,
And banks piled up in bay and estuary,
Thick-clad with leafy growths, are now subsiding,
And o'er their site will waters soon be gliding.
Fair forest scenes where land-snails find a home,
Where millipedes and centipedes love to roam,
Where may-flies flit, and crickets trip and sing,
And plant-lice to the vegetation cling,
Where beetles drone, and scorpions make their lairs,
And spiders spin and stretch their webs and snares,
Where stick-like looking insects feed and fight,
And cockroaches take wing, as comes the night—
Aye many a scene thus filled will by degrees
A haunt become of countless water-fleas,
Of ganoids, sea-snails, wormy " lampshell " hosts,
And Shrimp-like life that haunts the sandy coasts.

As sinks some sylvan scene in all its pride,
Changed to lagoons by overflowing tide,
Assiduous labours Land to win again
Her leafy breadths, invaded by the main.
Down bring the rivers to the flooded shore
Cargoes of silt and shale, that slow restore
The sunken glebes, till they again can hold
Thick ferny brakes, and forests as of old.
Not but with threatened life these ever stand,
As wide they spread on frequent flooded land.
But on some favoured flats they prosperous grow
For generations ere the waters through
Their terranes stream ; and as old trunks decayed,
And fallen leaves and branches thick are laid,
Rich peaty bogs are formed, where plant and tree
Live in the very lap of luxury.

Long do the times of surface changes last,
With varying fortunes over regions vast ;—
Where lie to-day Europa's smiling lands,
And China's plains, and Australasia's strands,
And far to West through Nova Scotia's seas,
And in Columbia's scattered territories ;
Till in the long drawn surface rivalry,
Awhile with water does the balance lie.
And though to sinking flats from hill and dale
Load upon load arrive of sand and shale,

Dolichosoma *Loxomma*

Keraterpeton

CARBONIFEROUS PERIOD

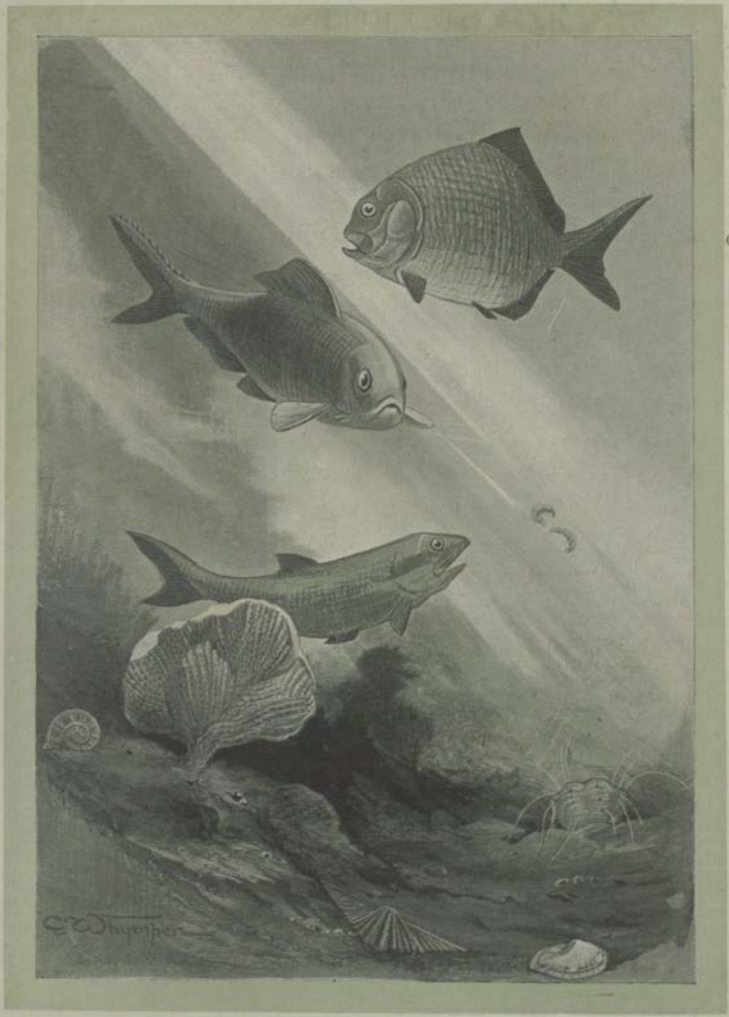
Choking the forests in their watery beds,
And slow amassing o'er their highest heads ;
And Land thus ceaseless labours to replace
The sylvan scenes within the sea's embrace,
No longer with subsidence keeps she pace.
And shrubs and trees as deep they lie entombed,
Compressed with growths that had before succumbed,
Will turn, through chemic action long at play,
To seams and beds of coal we burn to-day.

Some higher life-forms, sprung from finny ranks,
Climb here and there upon the marshy banks :—
Amphibious creatures, helped by Nature's hand,
Alike to swim the flood, and move on land.
(And well may Life in such new forms arise,
Amid the land and sea complexities.)
Small Newt-like looking beings are now ashore,
Moving with awkward gait, and striking awe
Through insect life. Whilst some with limbs more strong
Far through the forests push their way along.
Others there are, in form resembling snakes,
That limbless creep through mud, and shore-side brakes.
Have some mud-fish-like forms of bygone days—
The double breathers—undergone some phase?
And learned to creep from watery beds left dry
To haunt the banks, and boggy plains close by?
Have now their fins to foot-work been slow forced,
Or, through disuse, been well nigh wholly lost?

In times to come the meaning will be clear
Of Nature's wondrous work effected here,
In bringing backboned life to haunt the ground,
Where for long times invertebrates had found
Alone their way ; and there could creep and fly
Unchallenged by the higher life hard by.

As to their close the Carbon years draw near,
Lands, slow upheaved, above the sea appear.
Britannia's southlands, long beneath the sea,
Now rise again, contiguous territory
With land to east ; and long must be the while
Ere she will stand alone, a sea-girt isle.
Westward away new land-breadths greet the sun,
Where for long times the sea had freely run ;
And lonely banks and isles by waters rent
Unite to form Columbia's continent :
Though but in part ; for all the west terrain,
Save for some isles, still lies beneath the main.
And o'er the line upheaval too has joined
Long distant isles, that will remain combined.

Thus moves the hand of Fate from place to place,
Compelling Life conditions new to face ;
And though Change comes a lion in the path,
And lives must suffer, even unto death ;
Still Life itself, abounding in resource,
Pursues with steady steps an onward course.



Fishes of the Permian Period

(About ⅛th natural size)

To face p. 39

PERMIAN PERIOD

THE rebel rage, that fills Earth's vasty halls,
Soon finds weak points about the rocky walls,
That hem it in. And in the change around
Is heard again the sullen rumbling sound
Of grim volcanoes, long in slumber bound.
And many a quiet vale and peaceful plain,
Through mid Europa's long exempt domain,
Are destined to a changed and weird repose
Beneath thick ash, and steaming lava flows.

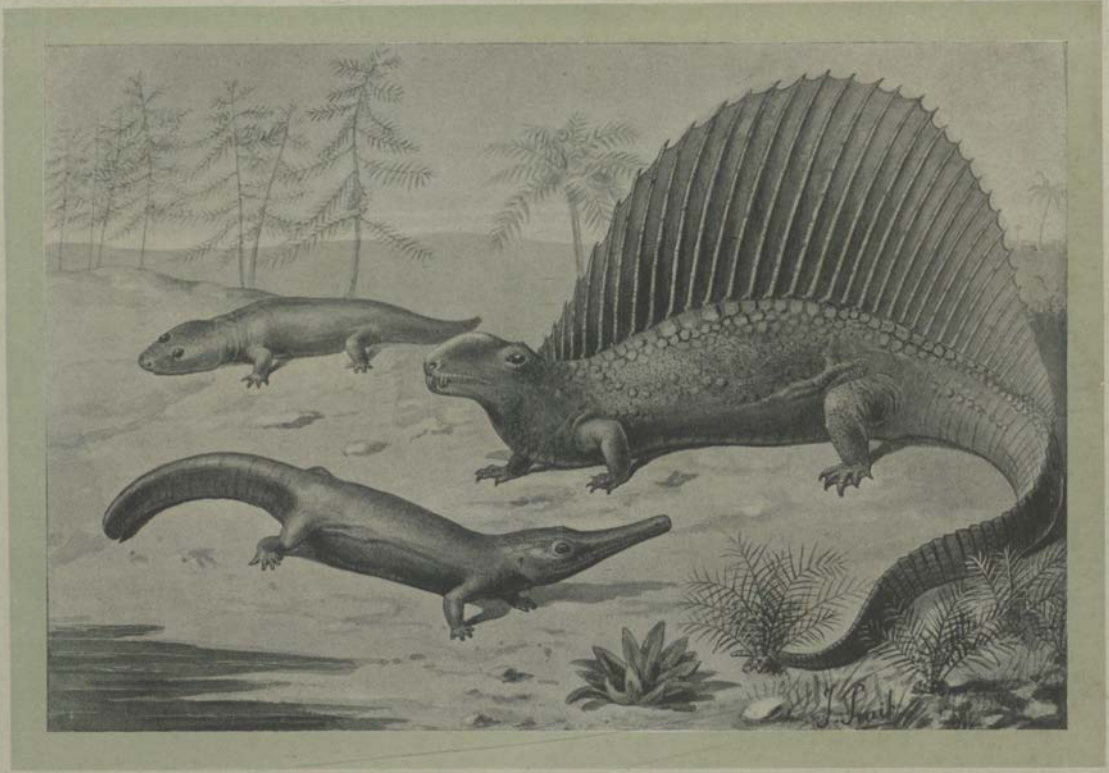
Club-mosses still survive on scattered sites,
Where too live on the reedy calamites ;
But both are destined now to know no more
The widespread glory of their days of yore :
And sigillarian forests all are gone,
Or but in dwindling clusters linger on.
The hardy pines hold vast dominions now,
At home on vale, and plain, and mountain brow.
And newer forms are spreading far and wide,
To Spruces, Yews, and Gingko trees allied.
The kindred Cordaites still, in parts, extend ;
Though drawing are their annals to an end.

Palm-looking Cycads, off-shoots of the ferns,
Spread through the woods, and clamber up the burns :—
Ambitious growths, that in the age at hand,
Will overthrow much plant-life through the land.
    The Trilobites, that in Silurian seas,
Held in their ranks a thousand species,
Girding the earth, but long since on the wane,
Now but in few and stunted forms remain.
The rugose corals now are forced to go,
And even "Lamp-shell" life is falling low.
And Goniatites that long had prosperous been,
And shewn adaptive powers, now scarce are seen.
Indeed much humble life, in many climes,
Seems ill-adapted to the changing times.
But polyzoa thrive ; and water-fleas
Still pass snug muddy lives in shallow seas.
"Sea-urchin" forms of old we still can trace,
But members, more developed, of their race
Are now abroad, ere long to take their place.
Amid the change, pearl-oysters, nautili,
And ark and mussel forms fare prosperously.
Some species new of fishes take their rise,
And ganoids here are seen of giant size.
But no forms here to bony strength attain,
And all of gristly substance still remain.

And all as yet old-fashioned tails possess,
Tails to whose end the spine is wont to press :
Such as the sharks and sturgeons of to-day,
Amongst their free-tailed brethren, still display.

Amphibian forms—the highest goal attained
As yet by Life—new strength and scope have gained.
Forms fast increase like those that in the days
Of flooded forests picked their slippery ways.
But in their ranks new creatures semblance bearing
More close to reptile life are now appearing :—
Large lizard forms, whose frames and ventral skin
Bear witness less of finny origin.
And some are here like to the Sphenodon,
That creeps to-day with languid limbs upon
New Zealand's northward isles ; and terror bound
By all the newer life fast closing round.
Thus rise the Reptiles, rugged pioneers
Of many forms as strange in after years.
And here they live the very lords of earth,
Though maybe Graces smiled not on their birth.
See Naosaurus here, a beast-like creature,
Whose back, high-crested, seems his strangest feature.
If foes he has, well may his lofty crest
A terror strike, e'en in the stoutest breast.

As monarchs truly 'mid the life on land
Must move such members of the reptile band ;
Skull, tooth, and gait and shape alike possessing,
That mark them e'en o'er reptile borders pressing.
And here lies Life as does a watershed,
Whence many streams their various courses thread.
But these, however wide they take their flight,
In the wide sea will once again unite ;
Whilst streams, once fairly launched in Life's domain,
Go divers ways, and never join again :
But split and split, and on new channels start,
Whose several waters flow for aye apart :
And whilst to humble lines are some decreed,
Others find ways that on to Fortune lead.



Actinodon *Naosaurus*

Archegosaurus
(About 5 feet in length)

PERMIAN PERIOD.

To face p. 42

MESOZOIC AGE

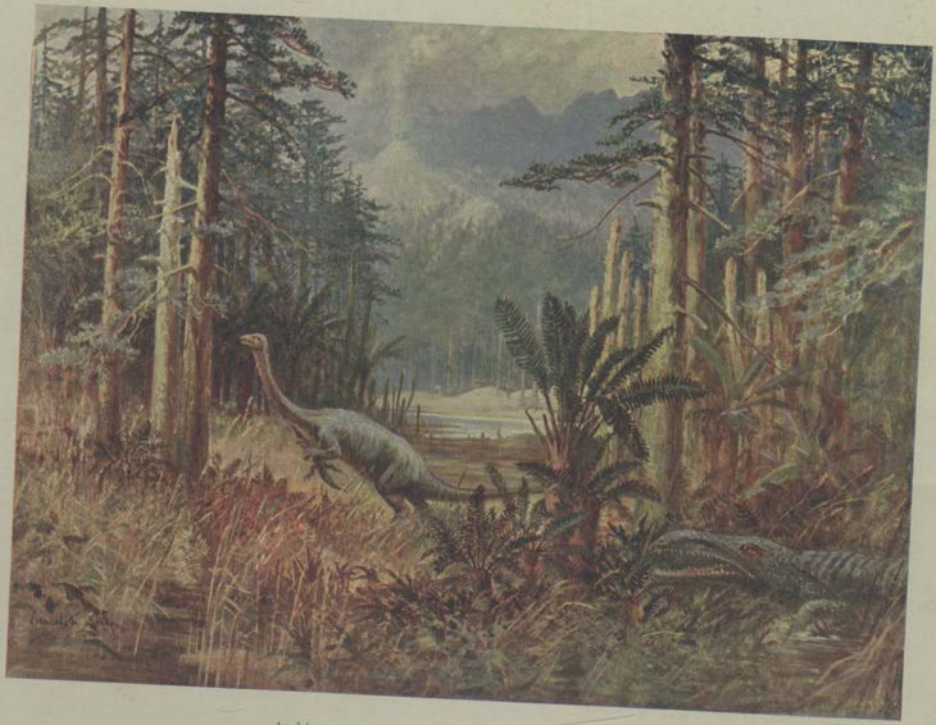
TRIASSIC PERIOD

THE scene has changed. Much life has had to yield
To forms that on Creation's fateful field
Have proved more fit to live, more fit to aid
The wondrous schemes for Life by Nature laid.
New lands have risen from the ocean floors;
Old lands are higher raised, whose temperatures
Have now less warm become. By slow degrees
The depths have changed in many lakes and seas:
And dried lagoons have left their salts behind,
Which Man, in times to come, will thankful find.
Thus have old Permian forms been forced to meet
Conditions new; and whilst some in retreat
Have safety found; others have braved the change,
And some indeed have gained a wider range.
But rival life, more fitted to the time,
Changes of food supply, and change of clime,
Have sealed the fate of hosts through land and sea,
That had, of yore, a wide prosperity.

Britannia's whole extent now well nigh stands
Above the sea : and up and down her lands
A cooler climate plays. Away to east,
And with her joined, stretch wide lands now increased
By great uplifts ; and many old domains
Of northern waters lie as arid plains.
But whilst to north, Europa builds her land,
The Midland sea invades her southern strand.
Italia's northern realms are being swept
By briny waves ; and waters now have crept
Helvetia's grounds, and even found their way
Where lie Germania's southern lands to-day.
Yet in the floods are sediments slow laid
Of which great mountain ranges will be made ;
And limestone beds in time will scale the seas
As Apennines, and Alps, and Pyrenees.
Beneath salt waters still imprisoned lie
The northern plains of Afric's territory ;
But from the southern breadths some lands are stretching
Across the sea ; and far as India reaching :
Along whose tracts some curious reptiles go,
And other life-forms wander to and fro.
Meanwhile large parts of Asia sea-swept lie,
Where shelly hosts and fishes multiply.
But greater is Columbia's west terrain,
And all her eastern coasts their line retain.

To rest slow sinks the spent volcanic rage
Throughout the world; till in some future age
Like to a giant refreshed it will appear,
And start again upon its mad career.
Great change and stress has life been forced to brook,
And now it rises with a different look
From what it wore of old. New species,
Sprung of the old, now haunt the lands and seas :—
Forms that, amid the changing scenes and climes,
Displayed a power equal to the times.
For in this changeful world in which we live,
A slight adaptive power will often give
Great steps in life to some; whilst those, in whom
Such power is not, sink slowly to their doom.
The club-moss trees have now all died away,
And broad-leaved cordaite shrubs no longer stray
Amid the piny woods; for sturdy grown
Cycadean life has borne them slowly down.
The reedy calamites, that rose of yore
In dense plantations, too are seen no more.
But some new forms, allied, keep up the line,
And through all time to come will not resign
Their hold of life; and "horse-tail" growths to-day
Attest their lasting, though diminished, sway.
Old forms of ferns still spread in thickly growth,
And from their ranks new species have come forth :

Whilst in amongst the thriving conifers,
The Permian voltzia now in force appears.
But though much plant-life old and dull has ceased,
In sombre garb is still the landscape dressed.
Yet life now breathes a less oppressive air,
For old plant-life has cleansed an atmosphere
With carbon long surcharged. Whilst far and wide
Roll clearer seas, by limestone purified.
Trilobites, that had for long times been depressed,
Are one and all in muddy graves at rest.
Thinned are "Sea-lily" ranks, though here and there
Some species new of graceful form appear.
Sea-urchin forms of old are failing fast,
By forms that rose in Permian times surpassed.
New types of brittle-stars are in the tide :
New coral-life is spreading far and wide ;
And Shrimp and Prawn like forms have multiplied.
Affected little by the change around,
Old forms and types of water-fleas abound.
But "Lamp-shell" hosts are yielding to the strain
Of changed environment ; and still are on the wane.
Numbered with forms that now are seen no more
Are those whose shells with spines were studded o'er.
But though the "Lamp-shell" life has ceased to thrive,
Some forms that date from far back times survive.



Anchisaurus

Belodon

TRIASSIC PERIOD

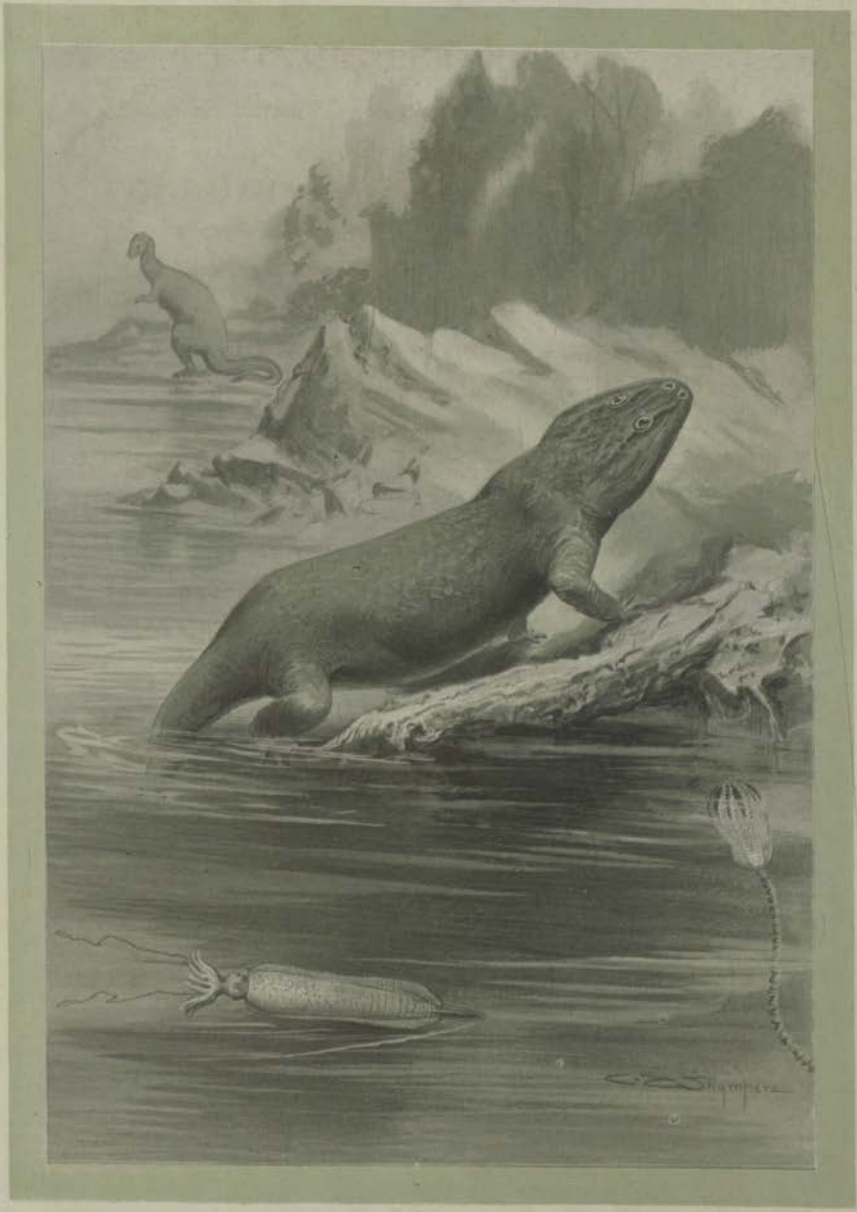
To face p. 46

TRIASSIC PERIOD

Other molluskan life spreads through the seas—
Pearl-oyster, Cockle, Scallop families.
Types old and new of Sea-snail plod their way,
And some whose forms will live on till to-day.
Old Cambrian forms of Nautiloids are here,—
But dwindling now, and soon to disappear.
Whilst forms more close to Cuttle-fish allied,
With horny hooks and bags of ink supplied,
Are now abroad :—the race of Belemites
Gregarious living, camped on muddy sites.
The Goniatites that in the Age before
Controlled the Ammonoid ranks are now no more.
But in their place the Ceratites now rise,
Less simply shelled, and other families
Come too in view : Arcestes here are found
In hooded shells, with whorls compactly wound.
Some Tropites too appear, in handsome shells,
With radial ribs, enriched with tubercles.
And other forms attest the progress won
By Ammonoids, though Goniatites be gone.
Wide spreads the race, and this is marked to be
The happiest span in all its history.

Descendants of the Shark-like families,
That ranged afar in Carboniferous seas,
Are here much as their sires. The while among
The Ganoid ranks new finny tribes have sprung.

Amid pro-Sturgeon forms, new types akin
To Carp and Barbel now enlife the scene.
And forms are here to Bony pike allied,
Whose gristly backbones, partly ossified,
Foretell the bony groups, that soon will rise
And far outstrip their gristly framed allies.
Browsing on weeds in shallow streams and bays
Lung-fishes roam, as in Devonian days—
A dwindling race, from whose depleted ranks
Had come the amphibian life along the banks
Of Carbon seas and streams. But though they wane
A place in fish-life long will they retain.
As see the mud-fish, in the Gambia living,
And in the Amazon and its affluents thriving;
And barramundi that pursue their way
Along the banks of Queensland's streams to-day.
  Amphibian life that groped through Carbon slimes,
And grew abundant in the Permian times,
With more developed forms slow onward presses,
And many giants Newt-like now possesses.
Creatures it counts full twice three feet in length,
With broad and flattened skulls of bony strength,
And jaws with teeth in mazy patterns wrought,
And limbs with increased power of support.
Truly old fishes of Silurian seas
Have here revealed their capabilities.



A TRIASSIC LABRYNTHODONT. (About $\frac{1}{4}$th natural size.)

A Belemnite: under view showing funnel by the aid of which it moved backwards.

To face page 48.

And well may Man, as he casts back his eyes,
Ask to what altered state his race may rise.
But not through life amphibian, large or small,
Is nature now advancing to her goal;
And though amphibian life will higher rise,
It is not there that Nature's yearning lies.
Frogs and the like will lead the amphibian van,
But not through them will Nature work to Man.
But through the Reptiles is she pressing on
To her desired, though still far distant, bourne.
'Tis these quaint creatures of the Trias days
That carrying are, and in mysterious ways,
Across the dark unsounded seas of Fate,
Fair Nature and her fortunes for their freight.
With wider range than on the Permian lands,
And more assertive spread these reptile bands:—
A motley group, that show in shape, and size,
And teeth, and structure wide diversities.
Truly some parent flood, high on the hills,
Has split its waters into many rills.
And from what far-off source have come these swarms,
Graceless and quaint, and of such varied forms?
Had old amphibian life the pliantness,
Resource, and strength to break and branch like this?
May be it had: for Nature seeks to raise—
And not in vain—from each acquired base

New types of life ; and these in time recall,
In but faint manner, their original.
And where else lay for her a starting ground
For all these curious reptile forms around?
Forms Lizard-like, as those of Carbon days,
That through the brakes and pine-woods found their ways,
Are still abroad : and in their frames still lie
Old signs that mark amphibian ancestry.
Others—Prosauri named—are also here,
Whose structures, more developed, less declare
Their origin ; and such-like forms, forsooth,
In Permian days already had come forth.
And here, and more advanced, they still live on ;
But in our day New Zealand's Sphenodon
Remains alone on earth to testify
Their type as still in Nature's family.
Some other reptiles, Theromorpha called,
Whose grim old sires through Permian woods had crawled—
Strange "beast-shaped" creatures, as their name implies—
Are also here of divers families.
Wide is their range :—through Afric's south domains,
And far away to India's hills and plains
They find their way ; and through Europa's lands
That lie about the Mid-sea's northern strands.

PAREIASAURUS

Total length about 9 feet.

(Remains found in Cape Colony, South Africa)

To face p. 51

Long times too had they roamed ; and back as far
As Permian days had found Columbia.
But though, in goodly force, they now career,
Long ere the end of Trias days draws near,
Their weird old stock will well nigh disappear.
Of various sizes are they ; some in length
Six feet and more, with short stout limbs whose strength
Can bear them well along ; and some there are,
As *Parieasaurus*, clad in armature.
Large skulls have some—high pitched as if to hold
More brains than what enjoyed their sires of old.
And some have teeth implanted in their heads,
The same as have flesh-eating quadrupeds.
True jaws of death are these to reptiles small,
And clam amphibians as on land they crawl.
Not but amongst the giant Newt-like forms
They oft find foemen worthy of their arms.
Others, with teeth more of a crushing kind,
Amongst the mollusk tribes their fleshpots find.
Whilst some, content with fern and cycad plants,
Obtain in ways less dread their sustenance.
Some toothless are, but like the Walrus own
A pair of tusks, with sharp points bending down.
Other quaint brutes about their heads possess
A pair of horns, and spiked excrescences.

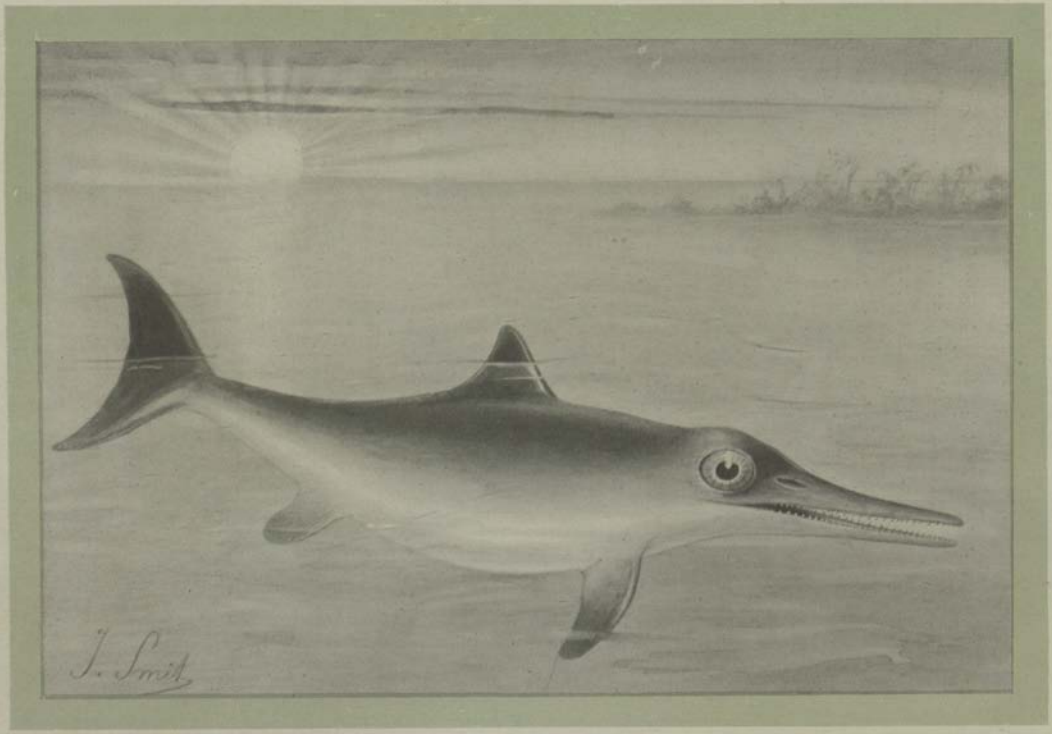
Whilst some, to peaceful ways of living born,
Have in their heads nor tooth nor tusk nor horn.
Although such forms may far from beauteous be,
They do not therefore miss felicity.
They have their happy huntings through the wastes ;
Indulge in not infrequent rich repasts ;
Rejoice in health ; fondle with parents' zest
Their playful bairns ; and soundly take their rest.
But though the fate of Theromorphs is sealed,
Other related forms are in the field,
Whose fortunes lie in front, and long will last,
Whilst Theromorphs lie buried in the past.
Chelonians now are moving through the land,
Mute heralds of the creeping armoured band
Of Tortoises and Turtles, near at hand.
But other beings, of more forbidding mien,
Than are Chelonians, now enlife the scene.
Not in our day through sea and land and air
Do such amazing forms as these appear.
Big birds and crocodiles, rolled into one,
An ostrich crossed with some huge Sphenodon,
Or Moa amalgamate with Kangaroo,
And clothed in leather of a lizard hue,
Might bring such monstrous shapes as these to view.
Hopping and waddling, crawling on all fours,
Live and increase these so-called Dinosaurs.

PLESIOSAURS

To face p. 53

Queer pear-shaped brutes they are, with big hind limbs
Of bony strength ; and in which Nature seems
To have laboured most ; and making these immense
Have done her work at other parts' expense.
For fore-limbs short, chest narrow, pigmy skull
Contribute little to the " terrible."
Still these grotesques have got their part to play,
And wide will range they ere they pass away :
And they from Theromophas' yielding hands
Will seize the sceptre, and command the lands.
    From their promiscuous ranks perchance had come
The crocodiles, that now in numbers roam
About the salt lagoons, and shallow seas,
And find their way far up the estuaries.
Varied they are in form : some small, with skulls
Pointed and short : some large, like garials,
With long and slender jaws. And some there are—
Unlike the rest—in bony armature.
Not much developed though these creatures be,
Beget they will a great posterity.
For Nature has not made them for the hour,
But in their flexile frames has lodged a power
To grapple with the times ; and lead the way
To divers kindred forms of after day.
    And here are other reptiles that possess
A wondrous measure of resourcefulness :

That after trial of a life on land—
Where maybe power failed them to withstand
Competing life with all its stress and strife—
Have now descended to aquatic life.
These curious creatures—Plesiosaurians named—
As tortoises in some respects are framed ;
Though necks they have, long as their bodies are,
And on their backs no carapace they bear.
Indeed, afloat, as emeus look they more,
Gone out to bathe, their feathers left on shore.
And prosperous is the race : for here and there
Some lanky creatures ten feet long appear.
But though on watery life they all are bent,
A difference have they in development.
For whilst the limbs of some appear to be
Of use on land as well as on the sea :
The limbs of some true paddle form have taken,
As life on land had wholly been forsaken.
But howe'er formed the creatures plough their way,
Keen hunters are they after finny prey.
"Fish-lizard" forms are also off the shores—
Icthyosaurians named—whose ancestors
Once trod dry ground. But blood of land-bred sires
No longer now their line of life inspires.
Far are they fallen from the old estate,
And more than plesiosaurs, degenerate :



A TRIASSIC ICTHYOSAUR.

$\frac{1}{20}$TH NATURAL SIZE.

(IN JURASSIC DEPOSITS SPECIES 40 FEET IN LENGTH HAVE BEEN FOUND.)

To face page 54.

With bodies turning to the shape of whales,
And urged along by two-lobed, fish-like tails,
And fore and hind limbs changed to fish-like fins,
And finny crests slow gathering from their skins,
Indeed as fishes have they now become,
And never more on land will seek a home.

But whilst some groups their ancient land-haunts leave,
And seek, afloat, their fortunes to retrieve :
'Tis on the land that Nature highest reaches,
'Tis on the land the path to glory stretches.
And now ere falls the Trias from Time's hand,
Creatures, than reptiles nobler, move on land.
For from their low-life prison of the past,
Some mammal forms are breaking through at last.

Strange rat-sized creatures now are in the woods,
Seeking, in timid raids, promiscuous foods.
And well for them if they escape the jaws
Of crocodiles, sharp-toothed, and dinosaurs.
For though of life on earth they are the head,
'Tis not a path of roses that they tread ;
And, just as Man when he found place on earth,
Hedged are they round with danger from their birth.

Small Monotremes are some : egg-laying creatures
That still retain in structure reptile features ;
But yet with milky juices from the breast
Nourish their young, as all the Mammal host.

A strait they seem through which has Life to pass
Up from the Reptile to the Mammal class.
Strange group it is, of which to-day alone
Duck-bills, and Spiny Ant-eaters are known.
Marsupials too are here,—a higher order—
And well across are these the Reptile border.
For they, unlike the Monotremes, bring forth
Alive their young, although of tiniest growth.
And though no forms, exactly such as they,
Are found on earth in any place to-day ;
Australia's Banded Ant-eaters maybe
Retain with them a close affinity.
Here then they are, these Prototheria called,
And moving freely where their fathers crawled :
Great is their future—are not such the sires
Of higher mammals of the coming years ?
The very bed and channel through which flows
Nature's main life-stream, as it onward goes ?
Here in these Prototheria then is found
The great main stream ; though up from underground
It seems to come ; as might a stream that wears
A subterranean course, and reappears.
And where amid the earlier Trias throng
Did Nature's main life-current flow along ?
Which of the " creeping " groups held in its veins
The blood that, fitter, in the struggle gains ?

Which one amongst them did a promise hold
That Mammal life might issue from its fold?
Not Icthyosaurs and Plesiosaurs betaking
To fish-like life, the higher life forsaking.
Nor yet Amphibians, once first in the race,
But long deposed from that exalted place.
For not from forms surpassed would one expect
This higher, mammal, life to come direct.
Nor to this state would Dinosaurians rise,
Marked as they were with strong affinities
To Crocodiles and Birds. Nor yet, late started,
Could Turtle types have thus so wide departed.
Of all the reptiles, Theromorphs alone
Had in their frames strong beast-like feature shewn :
And may we not to that old stock assign
The founding of the mighty Mammal line?
Had not those widespread reptile forms long since,
In Permian days, borne early evidence,
In tooth and skull, that they in time might pass
To forms of life above the Reptile class?
Not that the bigger members of the band
Would be the first to lift up life on land.
But in the ranks small members must have been,
Whose movements nimbler, and whose wits more keen
Would bring them on ; and to the life ahead
These were the ones that doubtless took the lead.

And as a country, once with empire wide,
Herself collapsing, yet might feel a pride
That in far lands, that once had owned her sway,
Her children strong and great held on their way.
So might old Theromorpha, near demise,
Had wish been theirs, and wit, to moralize,
Have nursed the thought that though at hand their doom
Yet from their ranks a wondrous race had come.

But though a higher life is to the fore,
The Reptile groups have yet great days in store :
And mighty monsters will adorn their line,
Ere they their sovran power on land resign.

CERATOSAURUS.

(Total length about 20 feet.)

Remains found in Jurassic strata of Colorado, U.S.A.

To face page 59.
Reference line 326.

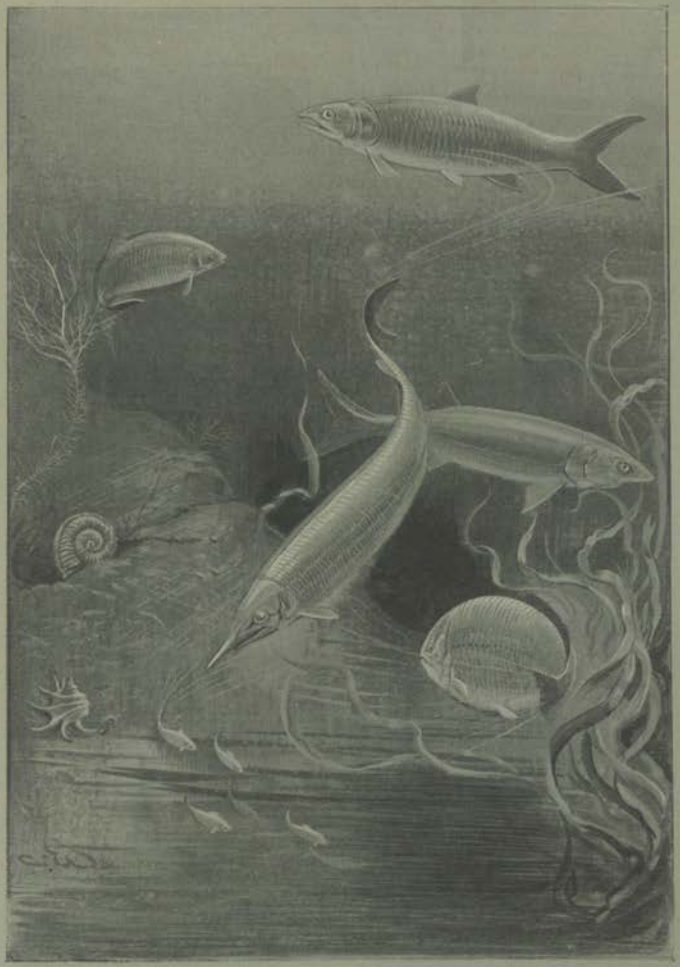
JURASSIC PERIOD

EUROPA's shores are now in full retreat,
As o'er old lines the Midland waters beat;
But still in parts Germania holds her own,
And not as yet is Muscovy o'errun:
And lands where Lesser Asia lies to-day
Are standing high to bar the waters' way.
But still to west and north the sea increases,
And with a widening path through Francia presses;
And Britain's land, that ere the Trias ended,
Was left, by slow subsidence, ill defended,
Has bowed to Fate; and now a shallow sea
O'erspreads her mid and western territory.

Great times are these for sea-life, large and small;
Or in the depths or on the littoral:—
For sharks and ganoids, mollusk species,
Icthyosaurs, plesiosaurs, and water-fleas;
For shrimps, prawns, lobsters, sponges, snaily forms,
"Sea-lilies," crabs and building coral swarms.

The finny life, wide different though it be
From what to-day swims up and down the sea,

Now ne'ertheless in several forms displays
More likeness to it than in older days.
True sharks, not merely Shark-like forms are here,
True rays, not merely Ray-like forms appear ;
And though pro-Sturgeons still may wend their way,
Sturgeons are here much as their scions to-day.
And in the Ganoids' silver-shining throng
Fishes of Salmon shape now swim along :
And other various ganoids cleave the tide,
To Bow-fins, Sprats and Herrings close allied.
Big Carp-like creatures wander on their ways,
Larger than those that lived in Trias days.
And fishes too are here resembling more
The Bony-pike than did their sires of yore.
And in their tails the Ganoids now display
Likeness more close to fishes of to-day :
But few there are, like those of days gone by
With stiff-spined tails, of little symmetry :
For now the bright and multifarious throng
With tails, free and symmetric, swim along.
Less gristly too are Ganoids :—soon will bone
Afford them frames more strong than now they own.
In Trias days already in the tide
Were some whose frames in part were ossified :
But up till now, a little sprat alone
Can boast a backbone, wholly made of bone.



FISHES OF THE JURASSIC PERIOD

About $\frac{1}{11}$th natural size

(After restorations by Arthur Smith Woodward)

To face p. 60

And this small creature would forsooth appear
The most advanced of all the fishes here.
In Nature's fateful story, oft indeed
The smallest forms are those that take the lead.
Though all its ancient genera are gone,
"Sea-urchin" life is gamely pressing on.
Molluskan life, with all its ups and downs,
Expands exuberant in congenial zones.
New forms of water-snail crawl on their way,
With likeness more to those that live to-day.
True oysters now are spreading far and wide,
And forming banks beneath the flowing tide.
Big members too there are, as if their food
Abundant were, and climate all they would.
Along the coast new Ammonoids are spreading,
The older, Trias, forms fast superseding:
But though the race adaptive powers has shown,
And strives in altered forms to hold its own;
Yet not in numbers does it seem to grow,
And palmy days it not again will know.
The once great "Lamp-shells" still are on the wane;
Nor do the Nautiloids in force remain:
And all such forms as in their ranks of yore
Were seen in long straight shells are now no more:
And but one family can the race display,
Yet one whose line will live on till to-day.

Thrive well the belemnites along the shores,
In spite of havoc wrought by icthyosaurs ;
Oft spurting from a well-filled sepia sack
A useful screen and blind against attack ;
And for their slaughter finding some redress
In Nature's blessing of prolificness.
The Shrimp-like life, that in Devonian days,
And Carbon times, disported in the bays,
And, in new forms, joyed in the Trias tide,
Has spread its crusty empire far and wide.
Of true formed shrimps innumerous is the throng.
Cray-fish-like forms crawl here and there along.
Small long-tailed lobsters too pursue their way,
Shaping to forms about our coasts to-day.
Craw-fish-like looking animals appear ;
With fore-limbs, thrice the length their bodies are.
And short-tailed Crab-like forms, few though they be,
Increase the crusty empire in the sea.
And changed indeed this empire now appears
From that which flourished in Silurian years,
When Trilobites—now vanished as a dream—
Reigned with sea-scorpions on the coasts supreme.
The whale-shaped icthyosaurs sea-life pursue,
Forgetful of the lands their fathers knew ;
And fattening on the plunder of the main
Some brutes to length of two score feet attain.

Jurassic Period

To face p. 62

With them compete along the life-filled shores,
With paddle limbs, the long-necked plesiosaurs.
These have indeed advanced from strength to strength,
And far surpass their ancestors in length.
But lanky necks and small-brained heads in life
Must have their drawbacks in a time of strife ;
And new breeds now are coming to the fore,
Less necked and bigger headed than of yore :
And these new forms, with brains of larger size,
Have hopes of better times than their allies.

The Turtle groups, by Trias heralds foretold,
Along the coasts a growing power hold ;
Proud with their shields, bequeathed a legacy
From some obscure old reptile family.
Great is their future : for indeed from them,
As branches breaking from a vigorous stem,
Families will come, that will in time command
An empire stretched from sea far over land ;
And whilst much other life runs out its span,
These will survive, and see the rise of Man.

Thus in warm seas, extending far and wide,
In depths and shoals have fishes multiplied :
And mollusk groups have spread along the shore,
And prospers crusted life as ne'er before ;
Whilst swimming reptiles, oft to giants grown,
Keep, with the sharks, the population down.

But huge Amphibians, armed with teeth quaint wrought,
Seem one and all to Nature's limbo brought.
Although the sea has trespassed and dethroned
Wide breadths of land Europa long had owned :
Land on whose breasts plant-life luxuriant grew,
And animals their daily life-breath drew :
Still can Europa boast wide continent,
Where Nature's strength, and freely, will be spent.
Vast piny forests still in glory thrive,
With fern and cycad undergrowth alive :
And with new plants the sylvan wealth is swelling,
Screw-pines, bamboos, and grassy growths foretelling.
But not of cheerful hue have forests grown ;
And o'er wide lands a constant gloom is thrown.
Yet through the scene an eager life vibrates,
To higher risen, and more varied states.
Insects are swarming in the shrubs and trees,
Grasshopper, Earwig, Beetle families.
Ants, white and brown, are busy in the soil,
Their dwellings raising with ingenious toil.
Locusts are feasting to their hearts' content,
And with cicadas' shrieks the air is rent.
Crickets are chirruping amongst the plants,
Bugs thickly crowd in land and water haunts.
May, dragon, caddis, snake, and scorpion flies
O'er pools and marshes in their myriads rise.

MEGALOSAURUS

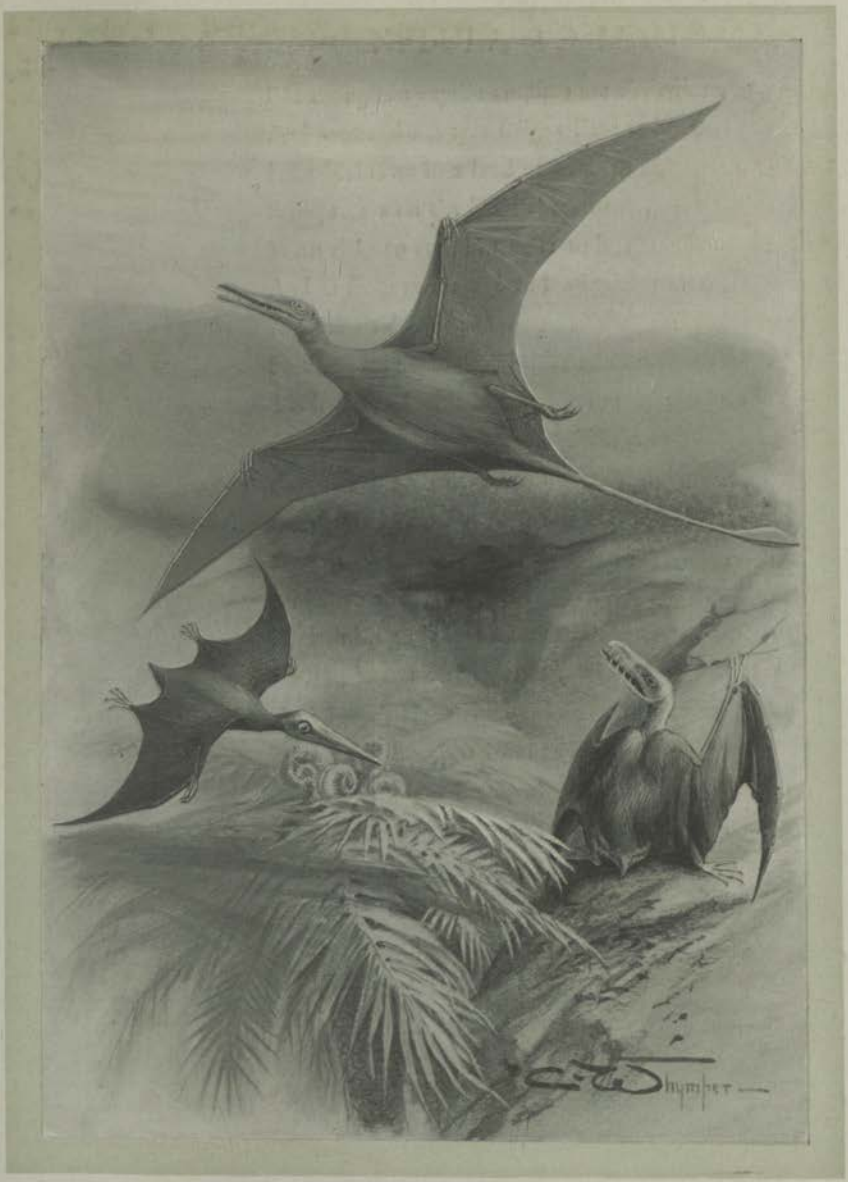
Total length about 25 feet

(Remains found in England, France, South Africa, and India)

To face p. 65

And spite of foes without, and civil strife,
The insect world keeps pace with higher life ;
Spreading in countless hosts through wood and brake,
(And who of insects shall a census take?)
O'er hill and dale, by sea and lake and pond,
Up in the air, upon, and under ground.
    About the land some reptiles are in sight
On hind-legs walking, reared up to a height
Of twice six feet ; enjoying wide survey
As Gogs and Magogs of a later day.
Scions are these of those weird dinosaurs
That in the Trias haunted wooded shores :
Those small-skulled, long-necked, pear-shape bodied creatures
Possessed of bird, and crocodilian features.
Nor is their race grown beauteous : nay has rather
From Beauty's path departed even farther.
But though they have their purpose, not through them
Is Nature building up her central stem.
Well off her trunk they are, and off will stay
Till Time shall lop them, one and all, away.
Yet magnates are they here : nor gone their day.
For though a higher life is on the land,
It lacks as yet the power to command :
And clear to keep of brute force such as this,
Must exercise its wit and nimbleness.

Not that in flesh all dinosaurs are taking
Their sustenance. Some brutes less dread are breaking
Branches from trees : and these supply their wants
And ferny growths and leafy cycad plants.
Sunning themselves on river banks and isles,
Or in the floods, long-snouted crocodiles
Abound and multiply. And oft in these
Will dinosaurs encounter ruthless enemies.
Reptilian forms that far their way have made
By sea and water, now the air invade.
And from their ranks some creatures new appear
That, armed with wings, rise bat-like in the air.
Although the reptiles of the earlier day
Developed hind-limbs in a wondrous way,
And brought forth hopping dinosaurs immense,
With hind-limbs formed at other parts' expense ;
And crocodiles possessed long after this
In fore and hind-limbs marked unequalness ;
Still in the ranks must forms have moved along
That by long use had made their fore-limbs strong.
And in such fore-limb members must have been
The sires of these winged lizards on the scene.
Not birds are these : they rather take their way
As bats and flying lemurs of to-day ;
With folds of skin from off their bodies drawn,
And like a mantle, by their limbs out-borne.



Rhamphorhynchus

P. spectabilis *P. crassirostris*

FLYING-DRAGONS

To face p. 67

But in what special forms in times gone by,
These flying lizards had their ancestry,
What man can say? A link is missing here
In Nature's chain, that some day may appear.
Amongst some unknown reptiles of the past,
Perchance they and the dinosaurs possessed
A common ancestor: whose bones from sight
Lie in the rocks, or else have perished quite.
But here they are, these dragons of the air—
Though small with mythic dragons they compare.
Still though the largest that amongst them flies
In body scarce exceeds a rook in size,
Yet some there are whose bat-like wings display
Far more expanse, than rooks' wings have to-day.
Sharp teeth they have, and large bird-looking skulls;
And tails have some, nigh half the length of bulls'.
A "little-finger" lengthened, holds and sets
Their flying cloak; and as might epaulettes
The other fingers hang, with freer play;
To be with vigour used, in holding prey.
Keen hunters are these creatures on the land
Of mammal life, and fishes off the strand.
Far o'er the land marsupial forms are spreading;
The largest not in size pole-cats exceeding.
Resemblance to opossums most they bear,
And banded ant-eaters, as in Trias were.

But though in reptile empires are their lines,
And mammal martyrs fall, as Fate assigns,
Like Hebrews in a land of Philistines,
Still presses on the little chosen race,
With risks to run, but ne'er to lose its place.
And as from moist and sullen looking morn,
A glorious day of sunshine oft is born ;
So though but doubtful skies these creatures see,
Their day, when it breaks forth, may glorious be.
A Baltic sea now far afield is riding
Across Europa's northern lands subsiding.
Germania by its flow is being swept,
And down to Midland waters has it crept.
Of Muscovy large parts are being o'errun,
And sinking plains no more salute the sun.
Siberia, Lesser Asia, Persia too
And India's lands all sink in part from view
As far the junctioned floods their ways pursue.
But though Europa looks as if 'twould be
Tne bed and playground of encroaching sea,
All is not gone : for higher parts obtrude
Their heads as banks and isles above the flood :
Where threatened life in safe asylum stays,
As if enarked, to hope for better days.
Britannia still holds dry some western lands
One with Hibernia, whose Atlantic strands

Teleosaurus

Dimorphodon

Duck-Bill

To face p. 68

JURASSIC PERIOD

Hold back the sea, far to the west away
Beyond where lie her western shores to-day.
And though Britannia's mid grounds most remain
Beneath the brine, where long indeed they'd lain,
Lands on her east still stand forth high and dry,
One, as of yore, with Norway's territory :
Whilst still to south her grounds connected stand
With Francia's high, uncovered northern land.
Though much of life has fled on every side,
And much has perished, of retreat denied ;
Still can Europa some resort afford
For creatures of the land to roam abroad.
Meanwhile the favoured tenants of the main
Can swim sunk vales and scour the captive plain :
And corals can extend for miles and miles
Constructing reefs, and clustering round the isles.

* * * * * * * *

But though o'er sinking lands the waters press,
Upheavals come the balance to redress :
And well nigh all Britannia's land submerged
Is being, by lateral pressure, gently urged
Above the sea. Germania too again
Boasts of wide lands that flooded long had lain :
And to the glebes, as nude they lie and low,
Comes leafy life its garments to bestow.

Great dinosaurs, like those of earlier days,
Still haunt Europa's woods and waterways ;
And hold their own through all these Jura times,
In spite of lands wiped out, and changing climes.
Still has the mammal life to seek in flight
Its safety from their glutton appetite.
Nor are the monsters in the least averse
To eat each other, when supplies are scarce.
And other breeds of dinosaurs are here
With great thick tails, that serve their frames to bear
As up they stand, content with plainer food,
And ply the leafy giants of the wood.
And well for them, ill weaponed for their size,
That on their hind-limbs they can lofty rise,
And mark in time flesh-eating enemies.

Whilst through Europa's land these monsters range,
Upon Columbia's scenes are forms as strange.
Here lumbers Stegosaurus on his fours,
With high-arched back, a king of dinosaurs.
Big is his bulk, with solid bones secure,
And great his length,—a score of feet and more.
Upon his back are bony plates implanted,
That look like rows of tombstones, small and slanted.
These oft may save him, when attacked by foes :
And clear his way, when through thick woods he goes :

STEGOSAURUS UNGULATUS

Top of highest plate, about 11 feet from ground

(Remains found in Jurassic strata of Colorado and Wyoming, U.S.A.)

To face p. 71

And e'en may serve, when he on love is bent,
To act effective, as a blandishment.
Small head the brute possesses for his size,
And taken up well nigh with jaws and eyes.
But though his brain is lodged in humble space,
Down by his haunches, in a larger case,
Some brainy tissue lies, as if in store
Against a time his skull might harbour more.
Much must he eat, for herbage is his food ;
And save in fight his jaws are free from blood.
But forms surpassing Stegosaurs are seen,
In point of size, and of as weird a mien.
Some here there are that look like plesiosaurs
With elephantine legs, as on all fours
They creep along. And some among the band
From nose to tail-end eighty feet command.
Some twenty tons a monster maybe weighs,
And woe to him if into bogs he strays,
For going there, for ever there he stays.
Small headed are these Brontosaurs, since named,
Although in trunk and limb they huge are framed.
Quite simple are their tastes. The trees and plants
Afford them all they need for sustenance.
Others there are more brained, and on their noses
A horn sticks up, as with rhinoceroses.
Flesh eaters are these knobbed Ceratosaurs,

Pugnacious too, with big and sharp-toothed jaws
That meet sometimes in necky Brontosaurs.
But dinosaurs there are less clumsy framed,
Here lives and thrives Ornitholestes named.
No sight is he, portentous to the eye,
As those long yards of life, Diplodoci.
Flesh is his food, and, be his taste what may,
Sharp tapering claws are his to hold his prey.
With hollow bones fleet does he trip along,
And graceful looks he awkward brutes among.
And as a one-eyed man amongst the blind
To monarch's place would facile pathway find;
So here where Beauty niggard favour shows
As some Apollo may this "raider" pose.

But though in parts Columbia's land is rife
With strange and monstrous forms of reptile life,
Yet through her scenes is life its progress gaining,
Much on the lines in other lands obtaining.
Thick is her soil with ferns and piny trees,
Crocodiles are swarming in her estuaries,
Ganoids and sharks abundant in her seas,
Plesiosaurs numerous up and down her strands,
And little mammals active through her lands.
Indeed throughout the world through all these times,
With little variation in the climes,

Ornitholestes

DIPLODOCI CARNEGIEI

From skeletons found in Jurassic strata in Wyoming, U.S.A.

(These reptiles attained a length of about 80 feet)

To face p. 72

JURASSIC PERIOD

Though different lands may favour special creatures,
Life little varies in its general features ;
Except, may be, in regions far away,
In polar lands, and from whose scenes may stray
A glorious life, though distant be the day.

New forms of flying lizards hover o'er
Europa's isles, and up and down the shore.
Some little creatures, sparrow-sized, are here
With skulls that likeness to a sparrow's bear.
And teeth have they, though but a scant supply
Compared with some of their fraternity.
For some of woodcock size pursue their way
Whose opened bills full rows of teeth display.
Some forms with swan-like bills are in the throng ;
Others with massive heads career along.
And some there are with narrowed flying sails,
And long free swinging, rudder-serving tails.
Quaint group they form, these tenants of the air,
And to what end is Nature pressing here ?
Or are these creatures now but *culs de sac*,
Relics of life whose part was played far back ?

Still thrive the mammals, spite of struggles keen,
And some new groups of young blood stir the scene.
Rat-kangaroo-like creatures leap along
The forest glades, and ferny brakes among.

Whilst other creatures live in holes and corners,
And may of Mole and Shrew tribes be forerunners.
Perchance descended from those gauze-winged flies,
That flitted joyous 'neath Devonian skies,
In places now some butterflies are seen,
Gay colours bringing to the sombre green.
With new life glad, wide wander they abroad
To seek such nectar as the plants afford ;
Waving their painted wings about the moors,
And forest glades, 'mid fighting dinosaurs.
How great and varied Nature are they powers!
Those monster reptile forms, these flying flowers!
And can it be that in some far back Age
In one life-form both had their parentage?
That from those specks of life that first arose,
As issued Earth from her long molten throes,
As from one source and font and common home,
Creatures, so wide apart as these, have come?
Here Compsognathi, so called, come in sight
That reach at least the smaller penguin's height ;
And on bird-footed hind-limbs, light but strong,
Like kangaroos they skip and jump along.
Small dinosaurs are these, but tending more
To birds, than many another dinosaur.
Transition forms, indeed, they seem to be,
And as might quit their old fraternity.

BRONTOSAURS

(Remains found in Jurassic strata of Wyoming, U.S.A.)

To face p. 74
Reference line 313

Yet far are they from birds, and still must roam
As prisoners held in ranks of Lizardom.
Nor can they, wingless, sail above the ground
As do the flying lizards all around.
Though in their frames more bird-like signs are found.
But forms there are, no more two stools between,
For birds true formed are now upon the scene ;
Feathered and winged, and proud with toothy bills ;
And lizard tails, bristling with plumy quills.
Long promised, long delayed, the birds have come,
Let loose at last from nets of Lizardom !
Queer Rook-sized creatures are these Jura ones.
Not furnished yet with light and hollow bones,
In aerial flight they little freedom find,
But drag as kites, mocked by a fitful wind.
Perchers they are ; and on some lofty tree
Will sleep at night in fair security ;
Unless some mammals in nocturnal quest
Of fleshy food should chance to break their rest.
Here then, at last, is Nature clearly seen,
Where she for long had as in twilight been.
For in a sense birds long were "in the air,"
Before they did in actual form appear.
Long were their shadows cast in many creatures,
That more or less possessed true bird-like features ;

And to the early Dinosaurs may be
Runs back the chain of their long pedigree :
Or if not so : they and the Dinosaurs
At least had come from common ancestors.
    Still birds are here ; and here they will remain,
And glorious hosts will follow in their train ;
Though far indeed and hidden is the day
Ere these to light will work their arduous way.
But come they will, an ever-swelling force,
Hiding 'neath glossy plumes their humble source.

ARCHÆOPTERYX (the earliest known fossil bird); and
COMPSOGNATHUS, a small Dinosaur.

To face p. 76

CRETACEOUS PERIOD

Now comes a time, when through the land and sea
Great change is wrought, all slowly though it be.
And changes great so slow-stepped oft proceed,
That finite life scarce cares their march to heed.
But change must come, as shrinks the cooling crust ;
Lands must subside, and sea-floors be upthrust.
Along new beds must great sea-currents flow ;
In changed directions warm and cold winds blow.
Earth's course has ever been but phase on phase,
Ere since she simmered in primeval haze :
And change in every continent and clime
Must mark her history till the end of time.
So where afar the polar regions stretch
Away to scenes which man has tried to reach,
Perchance in time some change will slowly come
And far afield unhindered will he roam :
And lands perchance where now soft breezes blow
Will lifeless lie, entombed in ice and snow.
Upon Britannia's south uplifted lands
Which stretch afar, with Francia joining hands,
A large freshwater lake now wide extends ;

And to its basin, rivers, streams and rills
Flow down from east and west and northern hills.
About its margins piny woods are growing,
And fern and cycad growths their mantles throwing :
The while upon its clay and sandy bed
Small leafy growths, allied to sea-weeds, spread.
Here mussels, snails and countless cockles thrive,
And Bow-fin-looking ganoids come and live,
And never failing water-fleas arrive.
Turtles are in and out its shoals and isles,
And divers long, and short-jawed crocodiles.
As cemetery it serves for far and near,
Whither, as hearses, rushing currents bear
Much gruesome freight ; and on its floor
Are shot the bones of many a dinosaur :—
Of big Iguanodons, that far around
In upland meads and woods a home had found ;
And other reptile life, that as it dies,
May chance to fall within its tributaries.
Here little creatures of the mammal race
Too find at times a final resting-place.
Mixed with the sands and clays from rock fronts worn,
Small stores of iron are being downward borne :—
Stores that in time will mankind grateful glean.
For Celt and Saxon will invade the scene,

IGUANODON

Species varied in length from 15 to 30 feet

(Remains found in England and Belgium)

To face p. 78

And fuel making of the forest trees,
Will set alight ore-smelting furnaces.
But this great lake, with all its varied stores,
Is doomed to go, as sink its bed and shores ;
And as through Francia's sinking north domain
The Midland waters find their way again.
On to the lake they press with eager pace,
As might a lover to his fair's embrace,
Till the great sea, all barriers overrun,
Seizes the destined prize ; and they are one.
Woe to freshwater life that cannot bear
The changed conditions that have sprung up here :
Not only waters fresh with brine are charged,
But the great scope of sea-life is enlarged :
And on the scene great sharky forms appear,
And other raiding hordes from far and near.
Truly have "tears to drink" been given here.
But so it is, all life is as a loan,
Nor fish, nor flesh, nor fowl can call its own.
But not the Wealden lake, large though it be,
Is all that sinking Britain yields the sea.
A Baltic sea, wasting Germania's realm,
Is pressing west more land to overwhelm.
And slow across East Anglian lands it creeps,
Then, bending south, o'er sinking plains it sweeps,

Till one it is with that great Midland sea,
That had annexed South Britain's territory.
Away to west the junctioned waters wend
And o'er Devonia's lower lands extend ;
And then through central Britain find their ways,
As waters had in early Jura days.
Then west they press, till in array there stand
High hills to block the way to Cambria's land ;
And for a time here lies their western strand.

Britain's more northern lands still keep their hold
With Scandinavia as in days of old ;
And one are they with land, that westward stretches
And on to Greenland's well clothed terrane reaches ;
(For not as yet has climate, changing, thrown
An icy mantle o'er the arctic zone).

But by subsidence brought as to their knees
More lands are now surrendering to the seas ;
And vanish quite in regions far and near,
Alike in east and western hemisphere.
Indeed is Earth in such commotion thrown,
As since pre-Cambrian days she scarce had known.
Lands in Germania now sea-covered lie,
That had, from earliest days, stood high and dry.
Grecia that long aloft her breast had borne
Within the rampant floods has now been drawn ;

And deepening waters with their life-hosts lie
On vales and plains of southern Muscovy.
Britannia too is sinking more from view,
As west and north the seas their way pursue.
The Cambrian lands from sight have passed away,
Save for some isles, where Snowdon stands to-day.
And Scotia's lowlands have succumbed to Fate,
Although her highlands stand inviolate.
Whilst sinking Erin,—still with Britain bound—
Lets in the sea upon her northern ground.
But though Europa now has come to be,
Save for some breadths of northern territory,
Scarce better than an island-dotted sea ;
It is not through her provinces alone
That vales and plains by seas are overrun.
For Lesser Asia that in days of yore
Held back the sea now bars its way no more ;
Across these lands the waters now are stretching
To Persia's plains, and on to India reaching :
Where greeting waits them from the fiery jaws
Of grouped volcanoes, loud with rattle roars.
    Joined with the Atlantic ocean on the west,
By widening straits through Francia depressed,
And stretching eastward nigh to Asia's coast,
The Midland sea, as known to-day, is lost.

Lower and lower the sinking lands subside,
Deepening the mighty waters far and wide;
Till lands, that in Jurassic days were dry,
Beneath the brine some scores of fathoms lie.
And as along the Atlantic's watery way,
A chalky ooze is being formed to-day;
Made up, at lower depths, of shell remains
Of rhizopods, that dying fall as rains.
So on the beds of this Cretaceous sea,
That once were breadths of fertile territory,
Like countless shelly mites, by Death brought low,
Innumerous loads of chalky ooze bestow:—
An ooze that Earth's for ever shrinking crust
In time as limestone lands will slow upthrust.
Sponges in beds collected add in time
Their flinty substance to the forming lime:
And Man, in time will come upon the scene,
When long at work has chemic action been;
And in the buried sponge-beds will he find
Nodules of flint in neat array aligned:
And from them forge his weapons for the chase,
Till these to bronze and iron yield their place.
Corals that in Jurassic days had spread
Their reefs and isles upon the Mid-sea bed,
From these old haunts are well nigh wholly gone,
Though still they spread within the Equator zone:

FISHES (*Ctenothrissa vexillifer*) after A. S. WOODWARD.

HIPPURITES

AMMONOIDS (*Turrilites*)

SPONGE (*Coscinopora*)

(*Hoplite*)

AMMONOIDS (*Hamite*)

CRUSTACEAN (*Enoploclytia*)

(*Hoplite*)

CRUSTACEAN (*Clytia Leachii*)

SEA-URCHIN

AMMONOID (*Baculite*)

CRETACEOUS PERIOD

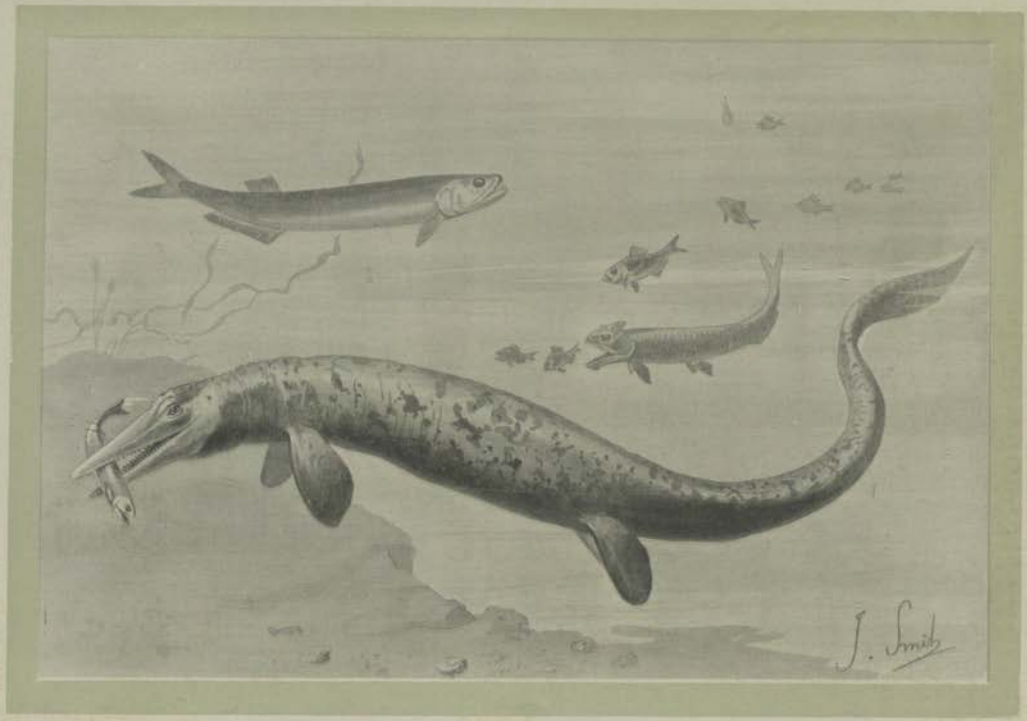
To face p. 83

But in the depths in regions far and wide
Their solitary brethren still abide.
New forms of star-fish sluggish move along ;
Sea-urchin life is now a numerous throng
Of various forms ; and in its legions here
Has reached from long, and oft hard-pressed career,
A golden age. "Sea-lilies" too around
Alike of stalked, and stalkless forms abound.
No loss or gain the "Lamp-shells" seem to show,
But though their tide of fortune still is low,
And upstart groups no longer meet our eyes,
Still linger on some ancient families.
The Ammonoids, though fated not to see
Good days again, are struggling gallantly.
Dwelling in old Silurian days in shells
Compacted close, with simple spiral whorls ;
Then, various formed, struggling long periods through,
Till in the Trias they their zenith knew,
They long with cuttle Belemnites had held
Wide range and power in the Mollusk world.
And now they rise to meet the altering state,
Like nations arming new from date to date.
Whilst some have shells coiled closely as of old,
Others have shells in crozier shapes unrolled :
And some in shells of handle form are here ;
Others in shells as straight as rods appear ;

Whilst some possessed with strange adaptive powers
Have shells that look like little twisted towers.
Truly the race is straining every nerve,
'Midst stress and change, its footing to preserve.
And could ram-headed Ammon see them rise,
Scarce would he here his namesakes recognise.
Thick crowd the Belemnites in shallows still,
But they have passed the summit of their hill,
And now decline. From long times on the wane,
The nautili revive, and thrive again ;
Though they in Jura forms unchanged remain.
Limpet and other Gastropods advance,
And soon will they attain predominance
Amongst sea-mollusk groups, as far and near
Ammonoids and Belemnites disappear.
Already well-developed types presage
Great future for them in the coming age.
For now 'mid earlier forms, "Fig," shells appear,
"Helmet," and "Stair case," "Spindle," "Rice," and "Ear."
Some early dog-whelks too are here and there.
Innumerous oysters—giant forms and small—
Gregarious live along the littoral.
Here too pearl-mussels, it would seem, are thriving,
For some in shells a yard in length are living.
And Hippurites, so called, bank off the shore
In long-drawn shells, horn-shaped and lidded o'er.

Wide though they range ; short record do they show
For in the Creta they both come and go,
And never reappear.
With new forms rife
Now prospers far and wide Crustacean life.
Crabs, that of yore were "few and far between,"
Are numerous now and widespread on the scene ;
And of the crusted groups would seem to be
The most progressive in this Creta sea ;
Holding the palm that in the watery ways
Was borne by lobsters in Jurassic days.
Strong wax the fishes up and down the seas,
And both in form and number wide increase.
Amid old forms sharks here pursue their way
Akin to Topes and Blue sharks of to-day.
Dog-fishes too swim in the finny throng,
And rays, new formed, the coast rocks lurk among.
Saw-fishes too are here "to do or die,"
And ganoids rise that call to memory
Forms that were prosperous in the days gone by.
But gristly fishes now no longer hold
The briny field as in the days of old.
For bony fishes numerous now are swimming,
The glory of the older groups bedimming ;
And though from ancient ganoid groups they started,
Far are they now from former lines departed :

And far, as Time rolls on, will they surpass
In form and number all the gristly class.
Here then in Creta seas we see unrolled
That higher life in Jura forms foretold;
And finny life its new foundations lay
Of families, that crowd its world to-day.
See wriggling eels, aroused from muddy beds,
Like sprouting bulbs are poking up their heads.
See here a shoal of silver herring sweep
From some unknown recesses of the deep;
Lo, there as if from instant death to fly
A flying fish uprises suddenly.
The perch-like Beryx here pursues his way,
Much like his scions in tropic seas to-day.
Resembling forms that haunt West Indian seas,
Grim barracudas swim, no friends to peace.
Some forms of sea-bream now abroad appear:
And early gobies wander here and there.
Forms, spiny-finned, are in the watery way,
Resembling Chromids in the Nile to-day.
Horse-mackerel too are in the flowing tide;
And fishes that to salmon seem allied.
In such new forms is finny life recast,
Slow breaking from its moorings of the past:
And giving promise, fitful though it be,
Of all the coming wonders of the sea.



MOSASAURUS

Remains found in the valley of the Meuse. Species varied from 15 to 45 feet in length.

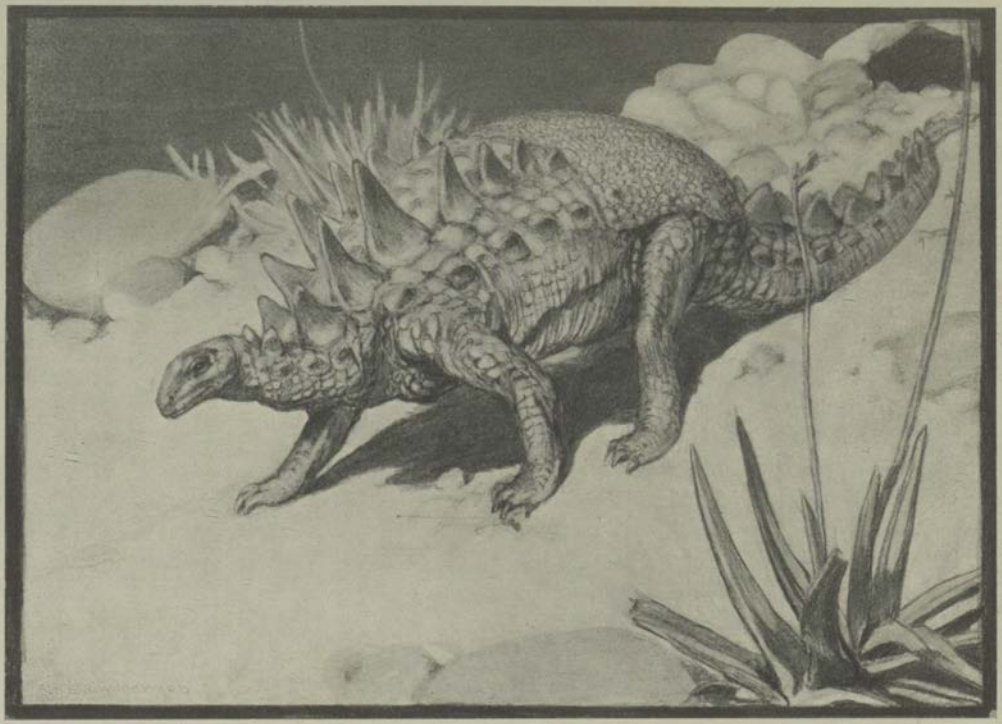
(Similar forms are found in the Cretaceous of Kansas, U.S.A.)

To face p. 87

CRETACEOUS PERIOD

Icythosaurs and plesiosaurs still abound,
Holding in check the finny life around.
For Nature, to be just, must needs maintain
A balance in Life's manifold domain.
And now some reptiles in the sea appear,
That look as strange as any ever there.
Indeed 'twould seem as if gigantic snakes,
Forsaking haunts in woods and ferny brakes,
Had come their fortunes in the sea to try,
As had the icthyosaurs in times gone by.
The Mososaurs are these, and here we see
Sires of "Great Sea-Serpents,"—if these will be.
Whilst through the scene the wondrous changes pass,
Mixed fortunes life on shore is called to face.
But through Europa's land, much though be gone,
The lamp of Life, though flickering, still burns on.
On isles and ridges jutting through the sea,
And still wide breadths of northern territory,
Pines, ferns, and cycads still uprear their heads,
Beside their brethren lost in briny beds.
Stealing from holes and corners here and there,
Small snake-like lizards seek the sunny air.
Dinosaurs still haunt the shores and woods,
Holding their own 'mid all vicissitudes;
And through the enisled and much diminished lands,
With greater ease are raiding mammal bands.

Indeed that little race would seem to be
Shut up between these monsters and the sea :
And well for such as in retreat have found
Haunts more secure than on Europa's ground.
But dinosaurs abound that peaceful roam,
With vegetarian tastes. Well armed are some,
Though meek disposed. See Polacanthus here,
With dorsal shield, and rows of spiky gear.
Winged lizards, large and small, fly o'er the flood,
To seek their flesh, and fowl, and finny food.
And Gull-like birds, well suited to the days,
Are busy diving in the creeks and bays.
The while across the eastern hemisphere
The briny waters o'er sunk lands career,
Columbia's now subsiding territory
An entrance gives to onward pressing sea.
Along the east, and on the southern coast,
Large tracts of land beneath the brine are lost :
And then, as time goes on, her western shore
Is driven back to lines it held of yore.
But banks and isles, that far to west away
Had long bespoke her breadth of later day,
Are looming now far larger through the main,
Though still wide separate from the east terrain.
And far to north the briny waters flow,
O'er thrice the land the Gulf of Mexico



POLACANTHUS

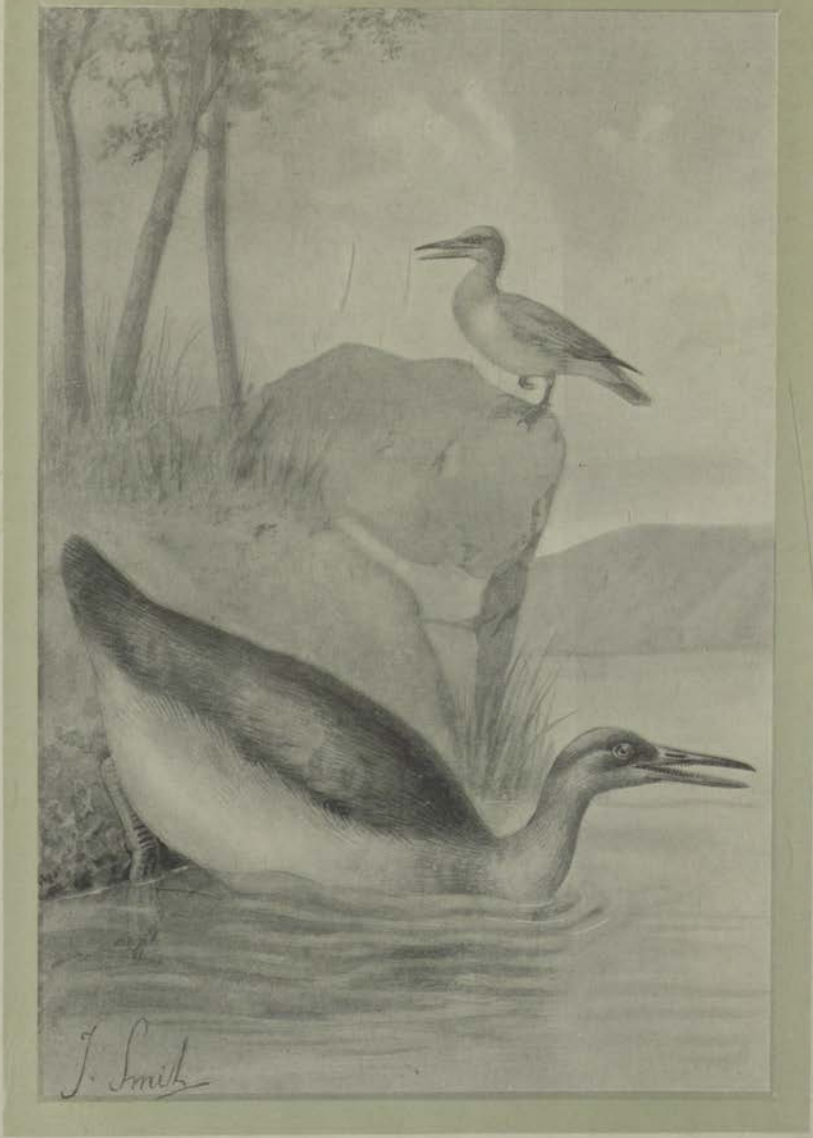
Restored from skeleton found in the Isle of Wight, and now in the British Museum (Natural History)

Total length probably about 25 feet.

To face p. 88

Conceals to-day : nor find they let or bar
Till lands high raised in northern Canada
Forbid advance ; and stay their being one
With chilly waters of the Arctic zone.
And in this mighty gulf, this central sea,
That sweeps across a dozen States to be,
Dwell forms of life that close resemblance bear
To those that haunt the eastern hemisphere.
Here live and die lime-forming rhizopods,
Mussels and oysters in their scalps and beds :
Sea-urchins, sponges, limpet, sea-snail swarms,
And Ammonoids of old and later forms.
Here too the cuttle Belemnites are thriving ;
And "Lamp-shell" tribes, though not so prosperous, living.
Fishes abound, but not such wealth is here
Of form as in the eastern hemisphere.
The gristly groups of ganoids, sharks, and rays,
As in Europa's seas, pursue their ways ;
But though the bone-framed fishes lag behind ;
Yet some of these, and monsters of their kind,
Are in the gulf. A form unknown to-day—
The Portheus called—here seeks and slays his prey.
Twelve feet is he in length ; voracious too
As any shark or ray the ocean through.
Here too the perch-like Beryx swims the tide,
And forms to barracudas close allied

Are also here. Far from the pebbly shores
Wander abroad huge long-necked plesiosaurs :
And some there are that far surpass in size
Those of Europa's seas and estuaries.
Elasmosaurus, giant of the host,
Some fifty feet from snout to tail can boast,
(And half his length is of his neck composed) ;
And looks he as some wingless bird and nude
Rolled up with some huge serpent, and endued
With power to swim. Turtles are in the sea,
Or basking on its shores complacently.
Sea-snakes are also lurking here and there,
And longer too than what Europa's are.
Upon the vast and scattered territory
That lies in horse-shoe shape about the sea,
Life long has prospered, and abundant grown :
For land has here not such subsidence known
As in Europa's realm ; but has upborne
Vast sea-free breadths ere since the Carbon dawn.
Rejoicing here in mild and humid air
Luxuriant ferns and cycads range afar.
Here grow some early palms, with fan-like leaves,
Gracing the scene : here too their relatives
Screw-pines of old Jurassic days are thriving,
And junipers, allied to firs, are living.



ICTHYORNIS

HESPERORNIS

(From the Cretaceous of Kansas)

About $\frac{1}{16}^{th}$ natural size

To face p. 90

Thick piny woods, that captive hold the night,
Spread on the plains, and many a mountain height.
To California's "Big Tree" close allied,
Sequoia firs are spreading far and wide.
Great kingdoms will these Redwood giants found,
As force they weaker growths to yield their ground.
Though Time brings change ; and stand they not to-day
As kings without kingdoms, or giants brought to bay ?
But pines and cycads, that for long have held
A wide dominion in the leafy world,
Spreading from mountain heights to briny shores,
Are now to face with new competitors.
For willows, planes, and poplars grace the scene,
The landscape lighting with a brighter green.
Here too has ivy crept ; and growths allied
To myrtle, fig, and laurel show their pride.
Whence came these higher types that far surpass
The cycads, ferns, and pines, and e'en the class
To which the palms belong—that stand indeed,
By virtue of their seed-leaves, at the head
Of all the leafy world ? Did land far north
With once mild air, turned frigid, drive them forth
To seek elsewhere clime suited to their growth ?
And have the southern airs, now lighter grown,
An opening offered in a milder zone ?

Whilst then, perchance, back in the olden days
In southern lands did Nature slowly raise
Her woods and brakes of club-moss, ferns, and reeds,
And other growths that sank in peaty beds ;
And whilst pines, ferns, and cycads carried on
The leafy life when older types were gone,
Away in silent lands, far in the north
Was she a different plant-life bringing forth.

As time goes on more growths forsake a land
Where maybe but as bushes could they stand,
And press triumphant on their southward ways ;
Like Gothic hordes on Rome in later days :
Fighting what growths they meet ; for plants have wars,
And what they gain, they gain as conquerors.
Towards Columbia's lands in force they come,
Of leafy states and dynasties the doom ;
Pushing, with might as right, their frontier lines
'Midst yielding cycads, and tenacious pines.

See here the stalwart oaks their branches spread ;
And hardy alders push their way ahead :
And beeches stretching far their solemn shade,
Jealous of other plant-life in their glade.
Up sloping mountains birches find their way,
And, rapid growing, forest wealth display.
Walnuts are casting round their ample shade ;
And tulip trees, in beauteous bloom arrayed,

REPTILES OF THE CRETACEOUS PERIOD.

LÆLAPS AND HADROSAURUS.

To face page 93.

Adorn the scene ; and glossy chestnut trees
Extend their arms, oft bent before the breeze ;
And straggling hazels, with but little grace,
Are elbowing their way from place to place.
Here too are maples, limes, and sycamores,
And sweet-gums with their yellow balsam stores.
And other growths from unknown lands appear ;
High scented cinnamons perfume the air,
And honeyed banksias their clustered flowers bear.
Holly and buckthorn here their way have found,
Persimmons, yellow flowered, bloom around.
Air-cleansing eucalypti hither stray,
And vine-like growths their juicy fruits display.
Thus move to wider life the nobler plants,
As sturdy bands of pushing emigrants.
And bring they not gay flowers to deck a scene,
Where meagre bloom but hitherto had been ?
And bring they not sweet scents about a world,
That rank and marshy odours long had held ?
Indeed it is as if a dreary land
Had transformed been by some magician's wand.
Huge dinosaurs stalk biped on the plains
Like walking obelisks ; nor do their brains
Betoken that they greater wit command
Than do their brethren on Europa's land.

But ponderous though the life for most part be,
Forms are there here that have agility.
See Lælaps here, dashing like kangaroo
At Hadrosaurus, tall, and massive too.
Indeed that brute's fond scheme would seem to be
To trip and crush his slender enemy.
For that swan beak, designed to dig for food
In watery haunts, is here of little good.
Here too does Triceratops enjoy the day,
And monarch walks of what his eyes survey.
Big is his skull, in length some twice three feet,
With hind part with a collar made complete :
And fringe of bony plates runs round the rim,—
Elizabethan frill-work, as might seem.
High as a good-sized elephant he stands,
And half a score of feet his frame commands.
Beaked is he like the turtle. On his snout
A small horn grows ; whilst two are shooting out—
Much longer these—above his placid eyes.
On feet, scarce equal to his weight and size,
With shambling step he takes his walks abroad,
Dragging a long thick tail—a monstrous cord.
And half his time in eating must be spent
To keep on plants his bulky tenement.
No creature of to-day can call to mind
A form like his. Perchance if we could find

TRICERATOPS

(From remains found in Cretaceous strata of Wyoming, U.S.A.)

To face p. 94

CRETACEOUS PERIOD

A turtle, crocodile and horned rhinoceros
Rolled into one, his like we might possess.
Crocodiles are far and wide a mighty host,
As fish, bird, mammal well know to their cost.
Some early forms of snakes are on the scene,
Reposeful lying coiled up in the green.
Come these from lizards, that in time past found
Wriggling a fitter means to move on ground
Than on short limbs, and so left limbless were?
For gifts unused all tend to disappear.
Winged lizards huge are flying through the wild,
And well may these be "Flying Dragons" styled:
For some big creatures are careering here,
That look like boats lateen-sailed in the air;
And, with their wings extended, breadth display
Thrice what the Griffon vulture does to-day.
The while the smaller forms toothed jaws can boast,
Their brothers big their teeth have wholly lost.
(Maybe this loss of teeth may progress show,
For birds as they progressed did toothless grow.)
How fare the mammals on this stirring scene?
Are they by reptile forces still hemmed in,
And powerless to assert their sovereign rights,
Moving in fear, as early Israelites?
So it would seem: for their advance appears
But little marked since old Jurassic years.

No forms are yet amongst them that surpass
The lowest orders of the milky class.
Still are they all, as in the long gone years,
To Spiny ant-eaters, and phalangers,
Duck-bills, rat-kangaroos and such-like kin.
But higher forms will soon invade the scene.
And could our eyes from these shores look afar,
And parts of Asia view and Africa,
Perchance these higher forms we might behold :
But there has Time thick mists unfathomed rolled.
Birds varied more than 'neath Europa's skies
Here haunt the bays and rocky promontories.
Sea-fowl are in and out the briny tide,
To plunging Grebes and Divers near allied ;
Birds too the Cormorant like here dive and swim,
And now and then is heard a Gull's shrill scream :—
Keen fishers are they all, and in their jaws
Are teeth, bequeathed by reptile ancestors.
Mexico is now well risen through the sea,
And miles of ridges, that in time will be
The Rocky Mountains are abreast the deep.
Whilst further south upcoming Andes peep
Above the brine. And land-raids seas have made
Will now, and in good measure, be repaid.

Australia's western land stands in the sea
A big broad isle of fertile territory.

PTERANODON

From Cretaceous strata of Western Kansas, U.S.A.

(Some species had an expanse of wings of 25 feet)

To face p. 96

Much had it gained, when joined by long terrain
In times far back with Asia's rich domain :
Ere slow subsidence and the ocean flow
Had made the scene an Archipelago.
And here its favoured breadths are blooming forth
With shrubs and trees ingathered from the north.
By like means too, ere came the sundering sea,
Had it obtained the motley ancestry
Of rich marsupial life, of times to be.
But too soon severed, it had failed to gain
Mammals of higher form on its domain.
East of the land another isle is seen,
But favoured less ; as it had scarcely been
In touch with wealthy lands. No rich array
Of shrub and tree has hither found its way.
Nor on the lonely scene as yet appear
Marsupial forms of life : but here and there
May some birds be ;—ancestral forms from whom
Cassowaries, emeus, and kiwis may come.
But good times are in store ; for slow its strand
Will by upheavals join the western land,
And hold a dowered consort at command.
New Zealand—all, well nigh, we see to-day,—
Well breasts the sea ; and far to west away
Her lands, all sparsely clothed, hold out their hands
As they would bounty seek from Austral's lands.

And south, till lost to view, is land extending
Through polar seas, with mild airs still befriending
Green plains and vales ;—scenes not as yet laid low
To fruitless waste, in constant ice and snow.

Back to Europa come we, where the sea
Has somewhat lost its late wide mastery.
For here upheaval has to rescue come,
And lands are rising from their briny tomb.
Chalk beds are bulging up above the main,
Slowly to stretch in long unbroken chain
From where stand Britain's limestone cliffs to-day
Right to the heart of Asia far away.

A higher plant-life now has reached her shores
Through perils of the deep and hard fought wars.
Some sturdy oaks stand king-like here and there,
Close kin to those the western hemisphere
Possesses. Fig-trees, walnuts bloom around,
Hollies, sweet-gums, banksias grace the ground.

How to Europa found they their long way ?
Was it by that continuous land that lay
Greenland connecting with Scandinavia ?
A pathway which to-day is sunken land,
Save where the Faroe Isles and Iceland stand.
Some did perchance. Still sea may prove no bar
To seeds of many plants to spread afar.

Carried by birds, or borne upon the wind,
From isle to isle wide regions may they find :
Or floating on the waves be swept along
Far from their native shores by currents strong.
And by such casual means in part at least
May these invaders have become possessed.
Here, then, they are, and leafy offerings wave
To deck, as it might be, the Creta's grave.
For now her time is run.
Thus through her years
Did Life expand throughout the hemispheres ;
Through land and sea, through rise and fall of clime,
Whilst Man still slumbered in the womb of Time.

CAINOZOIC AGE

EOCENE PERIOD

As one, deep in some tale of days long gone,
Of which no record is, save his alone,
Would grieve to find, where great his interest lay,
From his rare script whole pages torn away.
So he who Nature's rock-told tale would know
Must have, and oft, his eager soul brought low,
As conning through the archives of the stone,
He finds page after page, e'en chapters, gone.
So now a new life-world is all around,
The steps to which are rather guessed than found:
And Life is as on lofty hill sublimed,
With mists below, that hide the path she climbed.
Still, though a veil about the way be cast,
Things present are the outcome of the past;
And this new life we here see all around
Was link by link with all the past close bound.
Time oft destroys: yet oft it but conceals,
And what is hid Man's industry reveals;

EOCENE PERIOD

Tale-telling stores in unknown rocks may lie,
Ungathered links in Life's long history:
These seeking wide, Man may in time obtain,
And mend what is, to him, a broken chain.

While bursts a scene as bolt shot from the blue,
As startling nigh is what is lost to view.
For creatures that for long had ranged abroad
Have vanished quite, swept wholesale from the board.
No signs of Dinosaurians can we trace,
Triceratops is missed from his "accustomed place";
Brontosaurs and Stegosaurs too are gone;
And of like monstrous brutes we find not one.
Plesiosaurs have fled, as vessels might from shore
Put out to sea, and vanish evermore.
No flying lizards through the welkin sweep,
And Icthyosaurs lie lifeless in the deep.
All, all are gone, though be it in their day
Lords of creation were they in their way.
But other groups of life have ceased to be
As well as Earth's old aristocracy.
Plebeian orders too have had to bow,
And families of these have vanished now.
The Ammonoids, though strove they to conform
To coming change, could not ride out the storm.
Though still indeed, in limits close drawn in,
A few old shipwrecked forms may still be seen.

Gone too from long held mud beds off the coasts
Are Belemnites—wiped out as Xerxes' hosts.
Pearl-mussels' yard-long shells lie in the seas,
Mere relics of the past, and tenantless.
The "Lamp-shell" hosts, long waning, now comprise
But three or four old struggling families.
Of Sponges too, whole genera are gone;
Nor has Sea-urchin life been left alone.
Swept thus and cleared is Nature's fateful stage,
As starts its course the wondrous Mammal Age.

How came all this—this widespread overthrow—
That gave to Death these life-groups high and low?
Earth's movements doubtless had extensive been,
And great as those the world for long had seen.
Beds of Cretaceous seas had been uplifted,
And ancient coast-lines far and wide been shifted.
Seas long encroaching had been brought to bay,
And on new paths their currents forced to stray.
Through fractures in the crust had waters pressed,
And roused volcanic forces long at rest.
Craters with pristine wrath had roared again,
And clothed with lava many a verdant plain:
And earthquake waves high mounting from the sea
Had swept vast tracks of level territory.
Death warrants must these changes oft have signed
Of many lives: and with them came combined

EOCENE PERIOD

The breaking up of countless haunts of life,
Changes in food supplies, and keener strife.
Fierce epidemics too perchance had been,
Filling the earth with many a ghastly scene.
Nor in these movements, that afar had ranged,
Could clime in many parts have kept unchanged.
And change of clime brings changes in its train,
A blessing here maybe, and there a bane.
And much of life too specialized become
Must, in the change, have met a ready doom.

But causes that had far and wide removed
Once thriving groups had also Life improved.
For now at last come Mammals to the fore,
And Reptiles big and stupid rule no more.

What see we now about Europa's land,
Where still the seas, though beaten back, command
Vast breadths that in our day dry terranes stand?
Opossums still keep up the "pouchy" line,
Though destined are Marsupials to resign,
As spreads the newer, higher life around,
All haunts, in time, upon Europa's ground.
Small insectivorous creatures here are dwelling,
Shrews, moles and hedgehogs and the like foretelling.
And from their ranks some Bat-like forms have sprung
Flying on leathery wings the woods among.

But forms of life of lordlier mien than these
Are now upon Europa's territories.
Rapacious brutes are here, allied to bears,
Though brains, small as Marsupials' still are theirs.
And Wolf-like forms are here that call to mind
The Thylacines, that in Tasmania find
Last haunts to-day. And other beasts, unclawed,
Whose toes to hoofs are turning, roam abroad.
Coryphodons, some called, to Tapirs tend,
Though tusked as Boars : and awkward do they wend
Their well-screened way, 'midst jungled trees and plants,
On five-toed feet, formed as the Elephant's.
And in such beasts rude monuments we see,
Sources of architectural styles to be.
Others are here, Hyracotheria named,
With Horse and Tapir points, though Fox-sized framed.
These beasts, four-toed and three, move far more fleet
Than can Coryphodons. Indeed their feet
To suit their mode of life compact have grown,
And on some toes but little weight is thrown.
Perchance, ill-armed, they find in flight there lies
The way most safe to treat their enemies :
And tip-toeing oft for vigilance and speed,
They will in time their side-toes scarcely need.
Indeed these by degrees will disappear,
Or be but stunted forms of what they were ;

CORYPHODON

About 6 feet in length

To face p. 104

For life will ever slowly tend to lose
All Nature's gifts, which are not put to use.
What may these creatures fleet and Fox-sized be,
That, little-armed, may find it best to flee
Than face and fight a well-armed enemy?
Mixed forms they are: yet maybe hold the place
Of founders humble of the equine race.

Some Lemur-looking forms are in the glades,
Small active creatures, keen in nightly raids
On birds and reptiles; and on insect hosts,
(Sure victims, through all time, of holocausts).

Strikes Nature here a path, where will arise
The crown and triumph of her enterprise?

Whence came these various beasts now on the stage,
So much advanced on those that in the Age
Before were roaming here? One might surmise
Them sprung from earth, or fallen from the skies,
So sudden are they come. Where may we find
Forms intermediate, that will serve to bind,
And link them with the forms that met our eyes
The Age before? For these remote allies
Of many divers creatures to appear
In times far off, but slight credentials bear.

From some far country must they all have come;
What region then was their primeval home?

Where rose they to this greater rank and height,
By steps and variations infinite,
From low Marsupial life? Where in the wide
Were Mammals thus in structure modified?
Where, whilst Marsupials small were ranging far
About Europa and Columbia,
Was Nature calling, out of stress and strife,
These higher types of creatures into life?
Did Afric's plains or Asia's bring them forth,
Or some green lands in regions far to north?—
What man can say? Here hangs a close drawn veil;
Here miss we chapters from the rock-told tale.
Soft humid airs about Europa beat,
And southern lowlands steam with tropic heat.
The newer vegetation wide has spread,
And of the leafy life now takes the lead.
As states by hostile forces occupied
Cycads and pines must now draw in their pride.
Not theirs it is to turn the advancing tide,
Of oaks and walnuts, figs and holly-trees,
Sweet-gums and banksias from these territories.
Far now these growths of higher caste extend,
And divers of their class are on the land.
Planes, poplars, willows, cinnamons are here,
White-flowered magnolias bloom, and plum-trees bear

Their juicy fruits. Here too has found its way
The eucalyptus : and laurel growths display
Their glossy green. Here Nipa palms are bending
With nutty loads. Bananas are extending
Their yellow fingers. Here mimosas bloom.
Truly a motley horde of life has come ;
As men from divers regions might repair
To lands where cries of "gold" are in the air.
Now has Britannia won back from the sea
Some portions of her sunken territory.
But not as yet her south-east is released
From old invading waters from the east.
With Norway's lands still is she conjoined found,
And still by south-west lands with Francia bound.
Still holds she with the land that westward stretches,
And through the Faroe Isles and Iceland reaches
To Greenland's shores ;—a land that barrier stands
To keep chill Arctic waves off southern strands.
Not yet with lusty vigour Tamesis speeds,
But plays, a wanton child, about the meads.
But through the lands o'er which there heave to-day
The North Sea tides, a river wends its way.
Along through sylvan scenes its waters flow
Past stately palms, and where luxuriant grow
Big Royal ferns ; and on through shady bowers,
Rich with the scent of many coloured flowers.

And on they run, and join Germania's sea
That holds Britannia's south-east territory.
And 'mid this scene of palms ; in tropic heats ;
'Mid turtle haunts, and crocodiles' retreats,
To waters where the saw-fish finds a home,
And sea-snakes, long as boa-constrictors, roam,
Down rolls the river with its freights of clay,
To heap the ground where London stands to-day.
About the swamps, and on the riverside
Wade goose-like birds to ancient forms allied.
True teeth they lack : yet have they rough-edged jaws,
With sharp and tooth-like points, as blades of saws.
But here they are as creatures of the past,
Benighted forms, of Mohicans the last.
For birds abound, whose smooth horned bills betoken
Another link with reptile lineage broken.
Small active forms—Kingfisher-like they seem—
Dwell on the banks, and o'er the waters skim.
And birds resembling Herons search the stream.
Flat-chested waders too are fishing here
That Emu, Ostrich, Moa like appear.
Whilst on the rocks small vultures rest and ponder,
And o'er the seas birds Albatross-like wander.
More than Europa is Columbia rife
With new arrivals of the higher life.

EOCENE PERIOD

On the site of London

To face p. 108

Indeed some forms that in Europa roam
May well from her wide territories have come ;
(Finding their way along the terrane stretching
From Greenland's realms, and on to Norway reaching).
But here has Death destructive been no less,
And new life breaks with equal suddenness;
As might some troops that have attained a height
By marches stolen in the dead of night.
Coryphodons are here—tusked Tapir creatures—
Here too are Fox-sized forms with Horse-like features.
Five toes a-foot these budding equines own,
Though of the five has one quite useless grown,
Not reaching to the ground. And some less small
Seem to possess but three toes functional.
Here too some Pig-forms, porcine fathers, roam ;
And Marmot forms, and Lemur make a home.
But just as in Europa Life around
Has not as yet its wide vocation found ;
But sits the fence, rests at the parting ways,
Lost for the time in Nature's wondrous maze.
Some Creodonts, so-called, roam on the scene,—
Creatures that seem at some mid stage between
Carnivorous beasts, and insect-eating creatures ;
Nor are they unpossessed of Monkey features.
(Perchance from such the Lemurs took their rise,
That here and in Europa meet our eyes.)

Here too the Tillodontia named we find,—
Rodents, hoofed forms, and carnivores combined.
Here too are beasts that seem as 'twere to pause
Hoofed animals between and carnivores.
And other beasts, Phenacodons, appear
Made up of bull-dogs, tapirs, cats, and deer ;
Points too of pigs and horses do they bear.
Numerous are the birds : woodpeckers sound
The barky trunks : and Gannet forms abound.
Some eagle-owls are living in the woods,
And birds, large as the Ostrich, wade the floods.

Where Alps to-day and Himalayas rear
Their lofty heads scarce any lands appear.
But limy beds by Rhizopods long made
Are now with coin-like shells thick overlaid.
For Nummulites named, to Rhizopods allied,
Had like their brethren slow formed as they died
Thick beds of lime : and now Earth's shifting forces
Will thrust these layers on wondrous upward courses.
Already see we breaking through the sea
Alps and Himalayas in their infancy :
Though on their brows small sign as yet appears
Of those proud looks that one day will be theirs.
And other baby hills are forcing through
Their little breasts, about the waters blue.

PHENACODON

About 4 feet in length.

HYRACOTHERIA (In background)

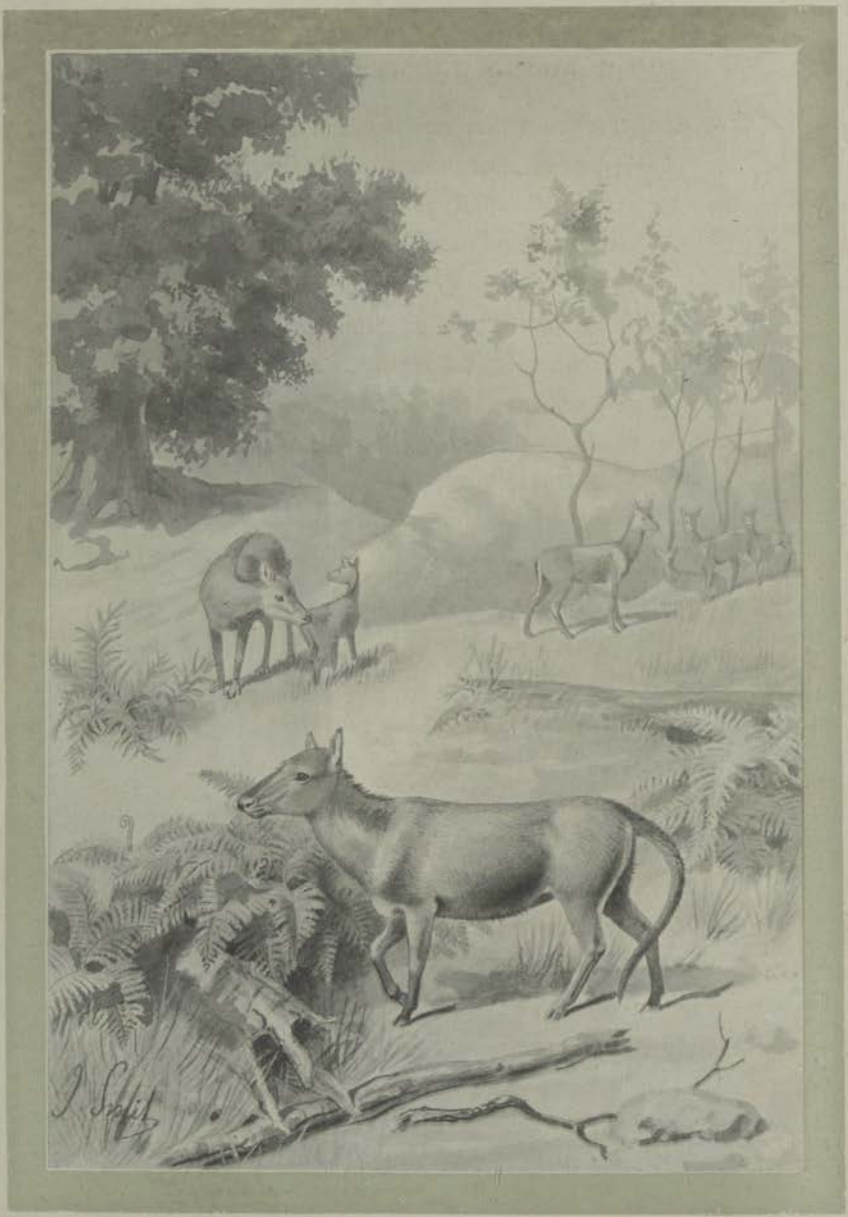
To face p. 110

Young Pyrenees their dimpled features show,
Carpathians too no longer sleep below :
And burly Balkans long clasped by the sea
Will soon forsake their briny nursery.
Afar and wide have spread on ocean plains
The rhizopod and nummulite remains.
Across the north of Afric do they span,
And Asia through to China and Japan.
And as to-day we see them mock the sea
In mountain chain and table territory,
We needs must feel, their builder hosts recalling,
That life was cheap, and time of length appalling.

* * * * * * * *

In southern seas, that wash Europa's coasts,
New wealth of form the teeming fish-life boasts.
And whilst on land strange creatures wend their way,
Wide different from the forms that live to-day,
No such unlikeness does finned life betray.
Still here new forms as sudden seem to rise
As did the mammal life that met our eyes
When broke the "new dawn" days. A gorge is crossed
But of the passage records all are lost.
Well nigh has gone the gristly ganoid race,
And bony offshoot types now hold their place.
Mackerel, and tunny here their ways pursue,
And wrasses wrought with iridescent hue.

"Trumpeters" and "Flute-mouths" increase the throng;
Globe fishes, blown as bladders, float along,
Bristling with spines erect, perchance alarmed,
As comes a "Surgeon" with his lancets armed.
"Star-gazers" sluggish lie with upcast eyes;
Small fry their stars, and waters wide their skies.
The Fishing Frog here lurks with rod-like spine,
Tipped with a lappet, gleaming through the brine;
And many a fish, deluded, drawing near
Will down the angler's jaws quick disappear.
The box-like "Coffer" too is on the scene,
And kindred File-fish, in his roughened skin.
Bass, blennies, turbot, perch, electric rays,
Cod, hake, and dories here pursue their ways;
And congers search the rocks in sandy bays.
Thus has new life, in haunts below the waves,
Sprung Phœnix-like—to us—from ancient graves.
New mammals now upon Europa roam,
Though still in "questionable shape" they come.
But general forms the special must precede,
And slow must high from lower life be freed.
All Nature's works, alike through land and sea,
Are monuments of patient industry.
All, all is growth: not all at once from haze
Were planets formed, and sent upon their ways.



ANCHITHERS XIPHODONS

ANOPLOTHER

To face p. 113

And long was Earth wrapt in her molten robe,
Ere she became a habitable globe.
    Phenacodons, as in Columbia dwell,
Are living here ; and Xiphodons foretell,
Though hornless be they yet, the lithe Gazelle.
Beasts, Palæotheria called, with hoggy manes,
In goodly herds are pasturing on the plains.
As sheep in size, horse-toothed, and hoofed they are ;
And tapirs, blent with lamas, most appear :
(And larger of their kind will pasture here.)
Some long tailed Deer-like Pig-like forms have come,
Of Donkey size, about these scenes to roam.
Whilst in the marshes other beasts are stirring,
Half Pig, half Hippopotamus appearing.
The Horse-like Anchithers here meet our eyes,
And seem as Shetland ponies as to size.
And other beasts are on the pastures feeding,
That though in form still Tapir like are leading
Along a way, whose now beclouded course
To Zebras points, the Donkey, and the Horse.
But under all these comprehensive hides
A Tapir genius, as it were, presides ;
And Tapir beasts to-day, with haunts but few,
Some pride might feel, if they their annals knew.
    Though up and down the Ethiope continent,
Faint be the view the shadowy lands present,

Yet in these times some record may we glean
Of brute life there, at least on Egypt's scene.
Here big skulled, thick skinned creatures meet the eye
That time may prove to be the ancestry
Of Elephants ; and truly they appear
Elephants "in the making" as it were.
From out their upper jaws are curving down
Two canine teeth to tusky *status* grown ;
Whilst other tusks, curved slightly upward, grow
From massive framework in the jaw below.
And though the brutes can get the head to ground,
And dig the earth, uprooting plants around,
Yet nose and upper lip that seem contriving
To launch a trunk, may change their mode of living.
And then in time are other forms seen here,
Whose upper tusks less downward curved appear,
The while the tusks, set in the jaw beneath,
Shoot straight ahead, right angled to the teeth.
But foremost framework in the jaw below
Will have, in time, great change to undergo,
To allow the trunk to freer use to grow.
Here too "*Arsinoitheria*" giants are found,—
Great thick skinned beasts, whose blocky heads are crowned
With fearsome horns. But though their skulls be great
And grim adorned, brains scarce proportionate

MŒRITHERIA

Probably stood from 2½ to 3 feet at shoulder

(Ancestors of Mastodons and Elephants. Remains found in Middle Eocene strata of Egypt)

To face p. 114 (No. 1)

PALÆOMASTODON

An ancestor of Mastodons and Elephants.
Probably stood about 4½ feet at shoulder.

(Remains found in Upper Eocene beds of Egypt)

To face p. 114 (No. 2)

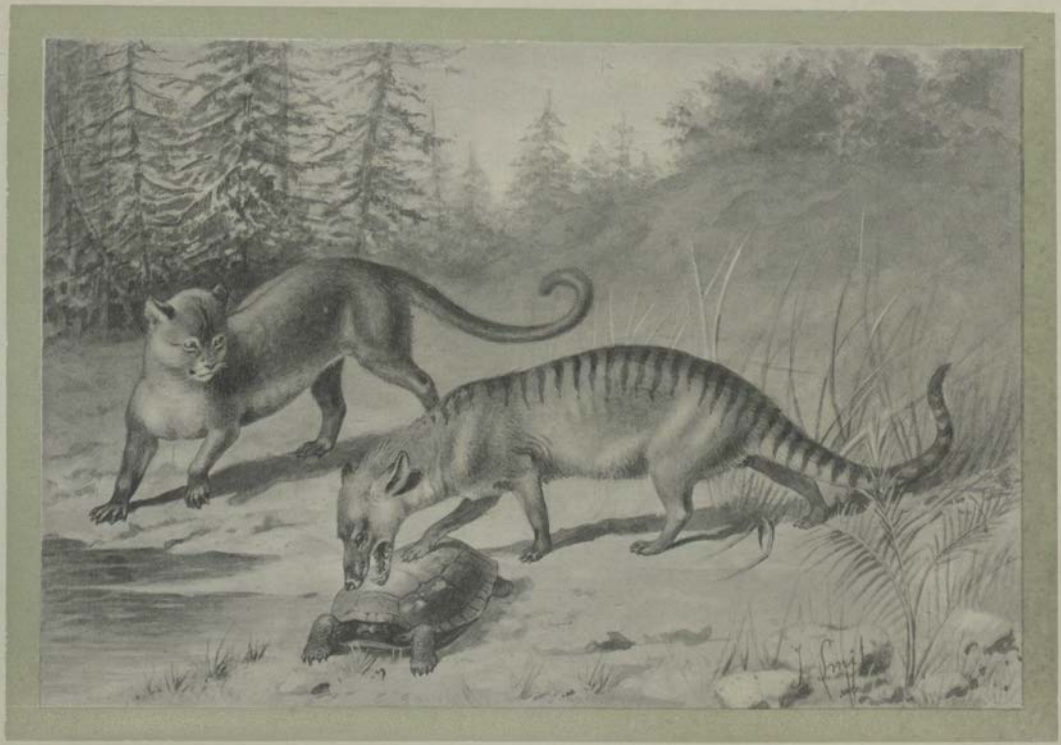
The brutes enjoy. From what old parent flood,
And intermediate forms, they drew their blood,
A mystery is. And though they may not be
Marked to beget a long posterity,
Yet must the ungainly monsters represent
Some line of life of long development.

* * * * * * * *

About Europa carnivores we see,
Still bearing sign of "pouched" life ancestry.
Creodonts, opossum-skulled, their ways are wending
And to Hyænas seem in structure tending.
And creatures roam that seem allied to Bears,
Though lengthened heads, as those of Dogs, are theirs.
Here too are dog-toothed Civet looking creatures,
That seem possessed of still more canine features.
Looms not the Dog, though for the time is he
Bound up with Bears, and Civet beasts to be?
New Lemur forms are here, safe in the trees,
And little dream their race's destinies.
Coryphodons, that here of old had been,
And, though be-tusked, to Tapirs seemed akin,
Are, one and all, now vanished from the scene.

Now at Columbia's realm again we glance
Where land lies out in fuller evidence;
And upheaved beds that bore her central sea
Have now made one long separate territory.

Though basined lands upthrust have borne away
The briny waters that upon them lay,
As Utah's salt lakes testify to-day.
Her widened breadths a higher life now hold,
Much more developed than in days of old.
Her Orohippi look like horses more,
Than those small equines living here before.
And though their feet four toes and three possess,
Yet on one toe of each foot most they press,
And outer toes are slowly growing less.
More varied now carnivorous beasts appear,
And Cat-forms prowl as large as lions here.
Strange forms abound : see here a Wolf-like beast
Enjoying at river-side his turtle feast ;
And brutes sharp toothed that swim to banks and isles
In search, perchance, of youthful crocodiles ;
As giant otters most they look to be,
Though be the Cat tribe their fraternity.
Huge Tapir-looking creatures here are living,
And pigs five-toed, and less, in swamps are thriving.
Short heavy hornless brutes too haunt the mires,
And may be, by their look, Rhinoceros sires.
On each front foot four toes they now display,
But forms to come with three will wend their way.
(How oft does Life, as on her voyage she sails,
Leave wake bestrewed with toes, and teeth, and tails.)



PATRIOFELIS AND MESONYX

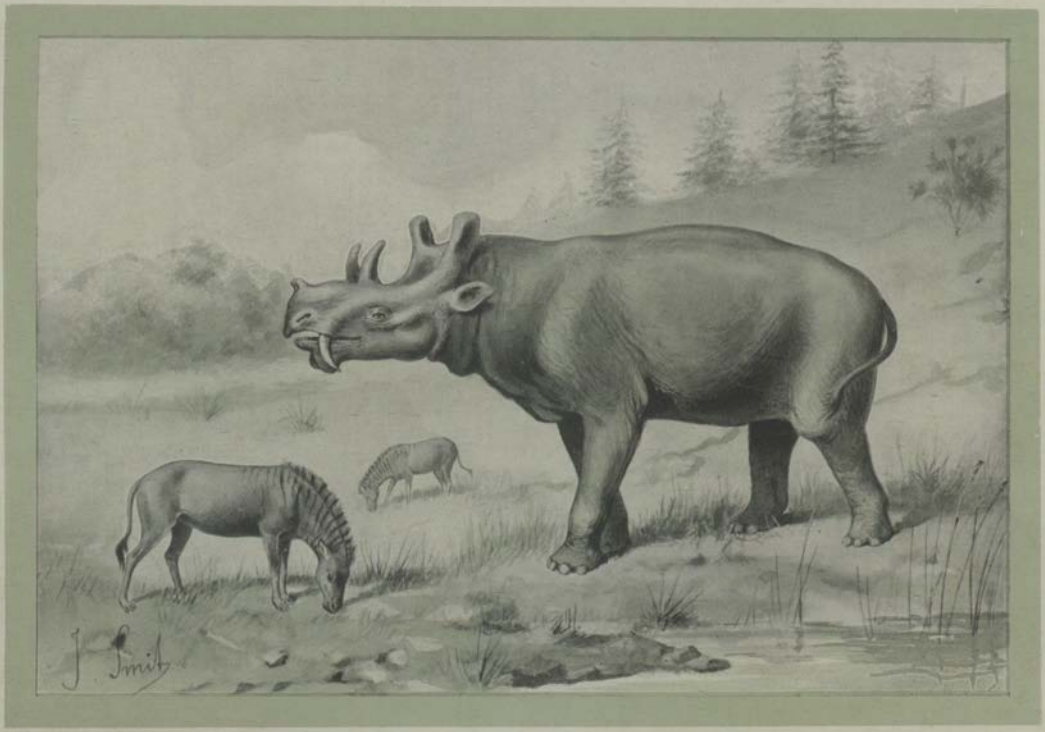
(From Eocene strata of Wyoming, U.S.A.)

To face p. 116

And here and there on plain and mountain side
Forerunners of the Deer tribes wander wide.
Akin to these some forms here meet our eyes,
That but as rabbits are in point of size,
Though not with these lie their affinities.
Like camels small, and lamas, most they seem ;
And here glimpse may we catch of Nature's scheme,
Which when in time worked out will bring to view,—
And through small forms does Nature work to new—
The Camel, Lama, and Dromedary true.

In length twelve feet, in height six feet exceeding
Some hoofed herbivorous monsters here are feeding.
And of this strange Tinoceras so-called band
No form is seen in any other land.
Though with those big horned brutes, that met our eyes
On Egypt's scene, seem their affinities.
As elephants in bulk they most appear.
Short-tusked they are, and on their skulls they bear
Quaint knobs and horns ; of service for defence,
If they can use them with intelligence.
But small indeed their brains are ; and around
No mammal beast so ill supplied is found.
And in a world these creatures seem to live,
That does to them but scanty welcome give.
Not wide they range ; nor long time do they last
Ere they as "failures" mingle with the past.

What forms "four-handed" in these regions live?
What prospect here of Man does Nature give?
Some Primates here still dwell, albeit not free,
And far are they from seats of dignity
Encompassed by brute force on every side,
On boughs of trees they chiefly must reside;
And on their wit and nimbleness depend,
And more in flight, than fight, themselves defend.
But though less links with Creodonts they hold,
And insectivorous forms of days of old,
Still do they in low Lemur stage remain;
And though signs be they higher grades may gain,
To Monkeys none as yet, or Apes attain.
Be Nature's wish and effort e'er so keen
A mammal life to bring upon the scene,
That can on two feet stand, and stand erect,
Yet does she not her limbless forms neglect.
Here flourish these, and in the woods and brakes,
From Lizards sprung, live Boa-constrictor snakes.
And though much Reptile life is swept away,
The Snakes at least are yet to have their day.
What now of finny life about the seas,
That restless press Columbia's territories?
Sharks, ganoids, perch and herring here are swimming;
But forms there are all other groups bedimming.



OROHIPPUS. TINOCERAS.

(Restored from remains found in Eocene strata of Wyoming, U.S.A.

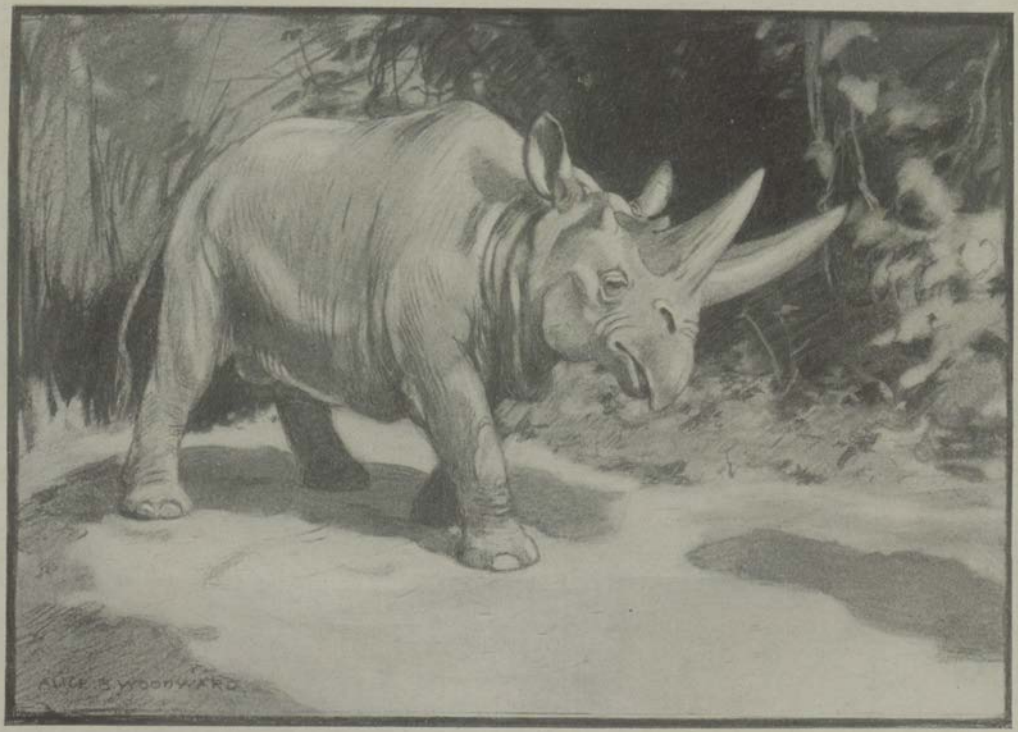
To face page 118.
Reference lines 405, 436.

For fishes Whale-like through the deep are speeding,
Big lengthy giants, sixty feet exceeding.
True Mammal forms they are, and to the breast
With firm fore-limbs their little ones are pressed.
From what old stock derived, what man can say?
Though surely must their sires in some gone day
Have lived ashore; and then their haunts have left.
Perchance of food or peace they were bereft,
And braved the sea, if haply there might life
Give ampler food, or fewer fields of strife.
Some unknown brutes amongst the Carnivores
Must thus, as emigrants, have left the shores.
And did their bodies swell to big extent
To keep them up in their new element?
And then by raiding wide the well filled main,
Did they in time to this vast size attain?
If thus these huge forms came, at least can we
In Nature say as wondrous things we see.
Nor to these seas is their horizon bound,
But far and wide their kith and kin are found.
And through Europa's and far Austral's seas,
Push they their heads, and sniff the balmy breeze.

Throughout the world abound the Mollusk hosts.
Oysters and mussels hold long lines of coasts.
Snail, Whelk, and Periwinkle tribes reside
In streams, lakes, shoals, and depths beyond the tide.

Thick stretch their shells, their pearly, porcelain homes,
As pigmy spires, minarets, and domes.
Well nigh all genera of to-day are here,
Though hosts of species will disappear.
Ammonoids and Belemnites long are gone,
But Nautili, as creaking doors, hang on.
The golden age of Lamp-shells too is past,
But spite of evil fortunes still they last;
Like some old tree, a wreck of former days,
Bearing, where once it branched, but twigs and sprays.
From toils which Change has woven round their state,
"Sea-lilies" scarce themselves can liberate.
Corals, old-formed, have well nigh died away,
Surpassed by forms, like those that live to-day.
But Nummulite coins still fall on briny plains,
Already strewn with endless life remains.

How wondrous, Nature, grows thy scene around,
And not a soul is here thy praise to sound!



ARSINOITHERIUM.

(Probably from 8 to 9 feet in length.)

From remains found in the Upper Eocene of Egypt.

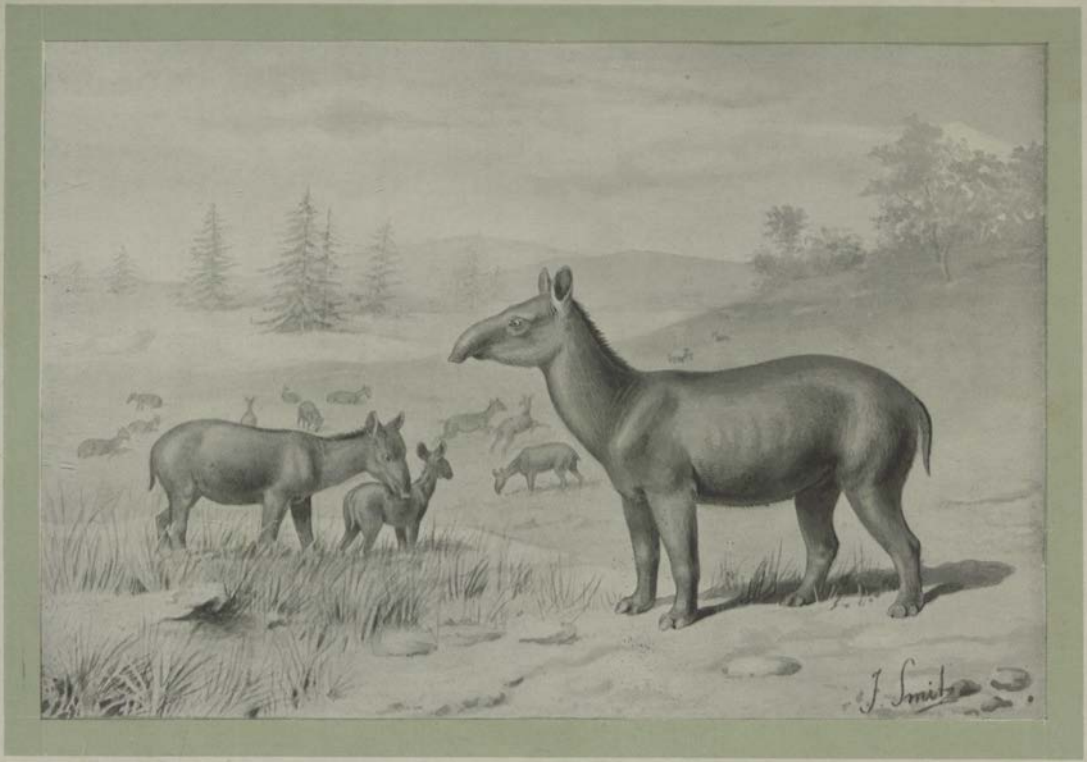
To face page 120.
Reference line 371.

CAINOZOIC AGE

OLIGOCENE PERIOD

SLOWLY the Atlantic sea a way has found
O'er lands, that from the Carbon times had bound
Britannia's southwest lands with Francia's realm.
And on she presses, threatening to o'erwhelm
All mid-lying land, and cut Britannia free
Of last land links with Francia's territory.
But limestone plateaus hold the waves at bay,
Where flows, white-walled, the "silver streak" to-day;
And though their further slopes are being pressed
By Baltic waters working to the west,
Long will the chalky isthmus stretching lands
Confront the cross sweeps on their threatened strands;
And hold Britannia with her neighbour bound,
Like cabled ship, or tightly tethered hound.
With different aspect does Britannia loom
From that she will present in days to come.
With Erin joined and Norway still she lies,
A province merged in vast massed territories,

Part of wide lands, whose outstretched arm retains
A firm hold still with Greenland's far domains.
Far south and west the Baltic waves are heard,
And north Germania now has disappeared.
The Netherlands to be are also hidden
Beneath the brine, which also has o'erridden
Francia's north central grounds. And once again
Shrinks far and wide Europa's land domain ;
And huge volcanoes roused by inborne sea
Now fire again their grim artillery.
And not the northern land alone is swept,
For Midland waters from the south have crept ;
And on and on they roll, as land subsides,
As they would join their brother Baltic tides.
And pass find they at last in central lands,
Where they can stretch and join their victor hands ;
Like chiefs of troops allied, on battle scene,
Clasp hand in hand o'er foes wiped out between.
Thus is Europa spoiled ; but in the seas
Stand Alps big grown, and giant Pyrenees.
And slow upheavals bring sunk lands in view,
Europa's pride and glory to renew ;
Slow forced are seas spoiled terrane to restore,
Till Mid and Baltic waters meet no more.
Change still goes on ; and Afric's north domain,
That long beneath the Midland sea had lain,



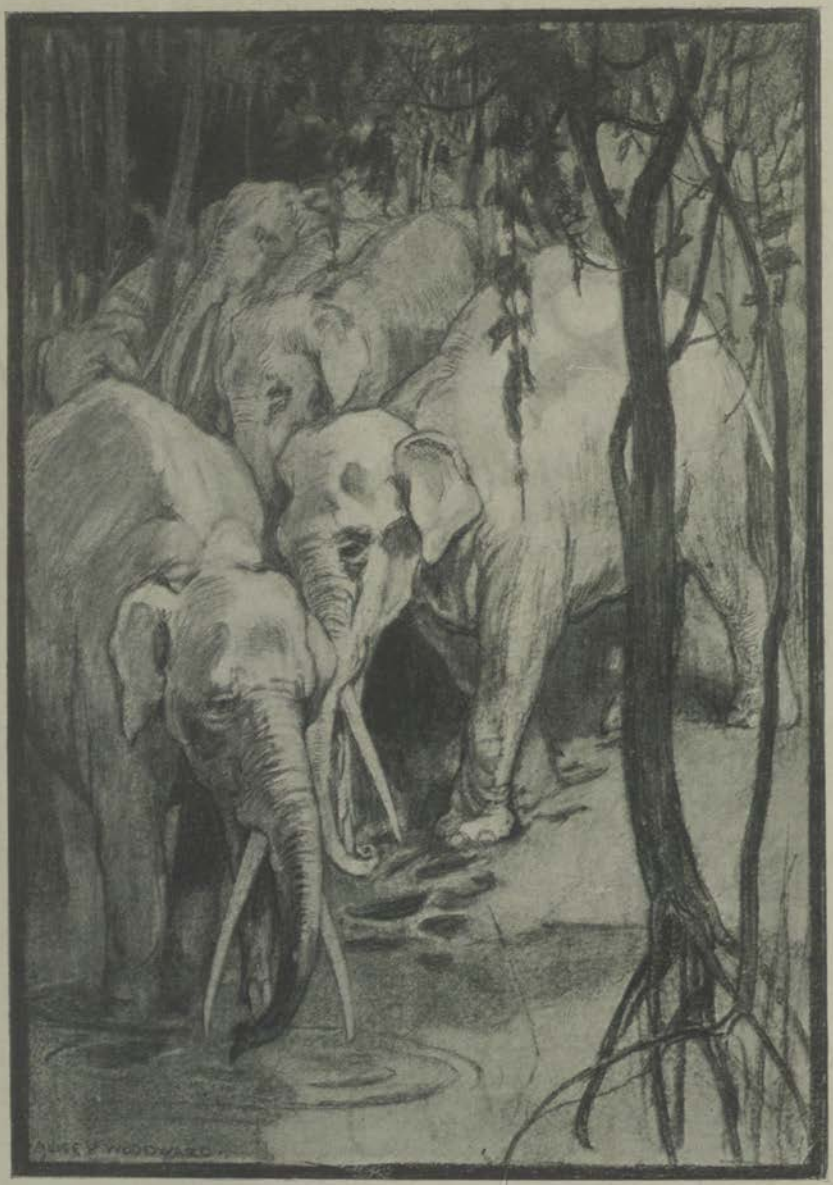
PALÆOTHERS.

(Species varied from the size of a Sheep to that of a Rhinoceros.)

To face page 123.

Now lifts its dripping shoulders, as might be
A sea-god from his fellows breaking free ;
And banks and islets spring up here and there,
As mermaids might, to bask in sunny air.
Then, bolder grown, does Afric show her hand,—
To link her terrane with Hispania's land ;
And continents, long parted by the sea,
Become by slow degrees linked territory.
And wandering life from regions far away
To "fresh woods" now, and "pastures new" can stray.
Warm airs are playing on Europa's plains,
And plant life thrives, refreshed by copious rains.
Trees as in "new dawn" days still flourish here ;
And Gum-trees now inhale the genial air.
Rich Custard-apples, fine-grained Spindle trees,
Distil their fragrance in the balmy breeze ;
And ferns, palms—fan and feather—here display
A wealth as in sub-tropic lands to-day.
About the marshlands thick-skinned creatures range
More numerous now, and still of aspect strange.
Old blended forms are still upon the scene,
Some stranded Hippopotami between
And Swine. But forms for Tapir *status* bound
Have now, at last, their destined haven found.
Whilst beasts, of Lophiodon descent, appear
Less Tapir, more Rhinoceros, than they were—

Indeed some new strange beasts are now in sight
That are assuming features definite,
And who, in this developed state, may be
Rhinoceros fathers. Here too we see
Small Pig-like creatures through the forests roam,
Fathers maybe of Peccaries to come.
Palæotheria that in the "new dawn" days,
In goodly herds were wont the plains to graze,
Are dwindling now, by other life outdone.
Indeed they are as on some down path gone,
Where Fate, ere long, will crush them every one.
The trunky race that had foreshadowed been,
In early Eocene times, on Egypt's scene,
Has hither come the woodlands to explore,
And formed less vague, than Egypt's brutes of yore.
Indeed a skull these Mastodons display,
That scarce is changed with Elephants to-day:
And well it bears the burden on it thrown
Of lengthening trunk, and tusks much longer grown.
Four tusked the creatures are, as foretypes were,
But more outcurved the upper tusks appear;
And further out the lower jaw has spread,
With foremost part scooped out as channel bed;
To take what food the trunk, that now has gained
An increased grasping power, has obtained.



MASTODONS

(*Tetrabelodon*)

Probably stood about 6 feet at shoulder

(From skeleton found in France)

To face p. 125

But this precocious jaw must be curtailed,
Ere can the brutes as Elephants be hailed.
Some Eocene Deer and Pig like forms are here,
Of Donkey size, but soon to disappear.
Some three-toed are, some "cloven" feet possess;
And hornless seem they all, and antlerless.
Whilst some but Rabbit-sized haunt watery plains,
And semblance bear to India's chevrotains.
From what ancestral font did these descend?
What ancient stock did Deer-like forms portend?
That multiplex old form, Phenacodon so named,
That hope of much high life had first proclaimed,
Amongst his jumbled comprehensive freight,
Had borne some points of beasts that ruminate:
And these the Anoplothers called—half swine
Half ruminants—may owe to him their line.
And through such forms does Nature not advance
To all her varied groups of ruminants?
Within such folds does she not, hidden, keep
Her antelope, her oxen, goats, and sheep,
Her giraffes, camels, and the tribes of deer,
That through the woods and grass plains will career?
Forms that have struck new lines in Life's domains,
Of Cat-like build, are prowling on the plains.
Some Leopard-sized boast in their upper jaws
Long tusk-like canines, good for raids and wars.

And other less fierce-toothed, of looks less grim,
Are Badger-sized ; whilst small as rats some seem.
Here in these Cat-like animals we see
In early forms the highest family
Of all the Carnivores :—the group that holds
Lions, tigers, leopards, pumas in its folds :
And in whose ranks the home-bred cat to-day
Can claim a place, though humble be its prey.
Here long legged Weasel-looking creatures range,
Filled with ferocious blood, time ne'er will change.
And forms are here where looms the Dog more bold
Than did he in those compound forms of old,
Where Civet, Bear, and Dog in one were rolled.
The "gnawing" tribes are spreading far and wide :
And small forms roam to Dormice close allied.
Forms Squirrel-like are scampering in the woods,
Or dozing in their tree-top solitudes ;
And Otter-looking creatures swim the floods.
Some Rat-like, Hamster forms, are in the meads,
And some forecast Brazil's small spiny breeds.
Forms insectivorous too about we see,
That may the fathers of the Hedgehogs be.
Shrews, Moles, and Desmans, that in times gone by
Through compound forms had peeped out timidly,
Have, as it were, from ancient quarters crept,
And into Life's arena boldly stepped.

OLIGOCENE PERIOD

Some forms half Pig, half Monkey looks display,—
Has Nature in these creatures lost her way?
But Lemur forms are here with teeth that bind
Them closer with the forms to-day we find.
And some indeed have skulls that seem to bode
That they to Apes have started on the road.
As though in sorrow for the great decline
Of their long prosperous and exalted line,
Here croak some frogs. Indeed the amphibian throng,
That once stood first Life's companies among,
May well bewail "the battle to the strong."
The birds, that now about Europa fly,
More signs have lost of Reptile ancestry;
And more like birds they are to-day we see,
Than seem the beasts to their posterity.
Cormorants, gulls, and gannets haunt the coasts,
And plump they wax upon the finny hosts.
Birds leggy, long-necked, like Flamingoes, wade
About the shallows. Spoonbill forms have made
Homes in the marshes: lanky Stork-forms seek
Their varied food through swamp, lagoon, and creek.
The Eagle fierce here cleaves his aerial way,
Bearing to craggy haunts his living prey.
The Falcon's eye too looks upon the scene;
And Osprey forms, and Buzzard—fishers keen—

Are busy here. Some Quails have come,
And through the pine woods Capercaillies roam.
Some swallow forms are twittering in the sun ;
And pheasants in the woody coverts run.
Sandgrouse and pigeons here have found their way,
And crows and shrikes. Here owls waylay
Snails, beetles, rats and other passing prey.
In marshy haunts, and through well rivered plains,
Are other forms bespeaking Rails and Cranes.
And Snipe-like Godwits through the marshes fly,
And Hornbills ply their beaky husbandry.
Forerunners of the songsters too are here ;
Nut-hatches, wagtails, starlings these appear.
And birds that may exploring flight have bent
From woody haunts in Afric's continent
Enlife the feathered throng. Some Trogons seek
New quarters here. And Plaintain-eaters shriek
Amongst the trees. Bold parrots hither wing,
And settle down, with scream and chattering.
Hoopoes—whose frequent notes sound as their name—
A merciless toll on worms and insects claim.
And Secretary-birds search snaky lairs,
Stalking about as though the land were theirs.

Changed and advanced indeed has bird life been
From what far back, in Jura times, was seen.

BRONTOPS.

From remains found in Oligocene strata of Dakota, U.S.A.

To face page 129.

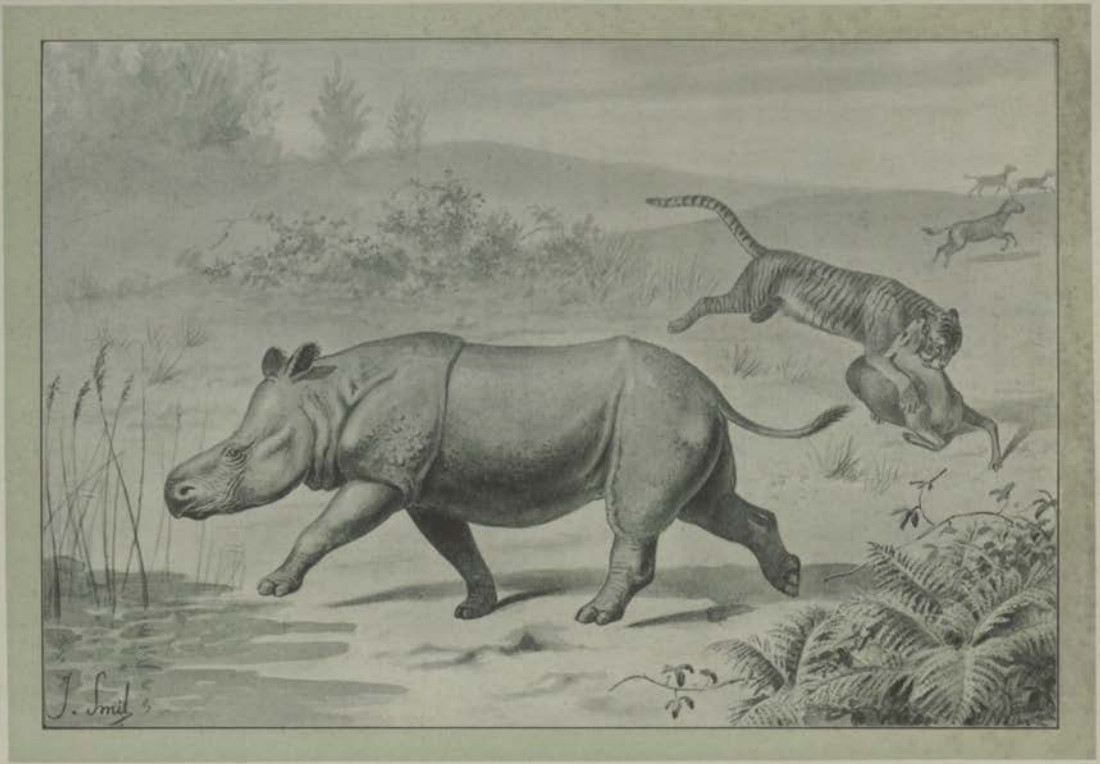
Small reptiles truly, in past age domains,
Held wondrous treasure hidden in their veins.
Yet all through Nature wonders do we find,
And this one not more strangely strikes the mind,
Than that in sea-weeds sylvan life began,
Or that in Lemurs lay the seed of Man.

The insect life, though it be called to pay
Enormous toll to Death, and day by day,
If judge we may by creatures that we see
About Europa's central territory,
Fares well enough. White ants of giant size
Are here abroad, and monster dragon flies.
Grasshoppers too, big-bodied, here abound,
As they indeed a paradise had found.
Here too Vanessa butterflies, with wings
Of dusky hue, have happy wanderings.
And though the insect world has much to pay,
Light is the heart with which it goes its way.

About Columbia's land, where oft have been
Life-forms unique, such life may still be seen.
Long here has Brontops lived, a thick skinned beast,
With length that measures twice six feet at least.
His bulky carcase seems most to present
Rhinoceros looks, with points of elephant.

And well may such as he have held for long
No humble place in Nature's varied throng.
But now he moves as might a time-worn man
That outlived has his years' allotted span.
And by degrees his fellows pass away,
Till he alone is left the wilds to stray.
And here unseen, unless by vultures' eyes,
Last of his line, the worn-out creature dies.
Yet came he of a fine old "Titan" race,
That had contrived for long to hold their place;
And striven had, by all means in their power,
To keep their pride, as fell their fortunes lower.
But spite of growing bulk, and shortened nose,
And larger horns that on their snouts arose,
Unable proved they to withstand the strain
Of Time, and all the changes in its train.

But in Columbia life has forged ahead,
Though be the "Titans" numbered with the dead.
Small Deer-like forms to Chevrotains akin
Wander abroad: and forms that seem between
Pig types and Deer, are numerous on the scene.
But whilst mixed parent forms contrive to live,
Types wide abound less vague, though primitive.
Opossums seem as those that live to-day,
And Voles from old Rat stock are well away.



Dinictis
Hyracodon

METAMYNODON

To face p. 131

OLIGOCENE PERIOD

Tusked Pig-like brutes are roaming in the bogs,
And bigger framed than were the Eocene hogs.
Squirrels, as those about Europa living,
Are faring well, and weasels too are thriving.
Whilst Tapirs now stand out distinct evolved,
With many ancient partnerships dissolved.
Rhinoceroses too are coming to the fore,
Though hornless brutes, as in the days of yore.
Unlike the breeds that will sustain the line
In later times, some not as yet confine
Their haunts to land; but oft in lake and stream
They wade and splash, and like "sea-horses" swim.
But not for food, nor yet to bathe and freak,
Do they, at times, and quick, the waters seek.
But thither rush, with all the speed of fright,
As they of carnive brutes, get scent or sight.
See here a tiger, "sabre-toothed," has slain
Some Horse-like beast, unwary on the plain.
Scared at the sight, does Metamynodon,
In hottest haste, to water quarters run.

And who is this whose end has proved to be
To victim fall ere time was his to flee?
To Metamynodon is he close allied,
Though that scared brute ne'er thought to take his side.
For different though they seem, yet in the past
One parent stock had held the two types fast.

And whilst to true Rhinoceros some had tended,
Others more nimble o'er the plains had wended
To lead a roving life ; and little armed
Had speed acquired to aid them when alarmed.
But though Hyracodons not horses are,
Nor ever will be, yet in Columbia
Well have the pigmy equines pushed ahead,
Far though as yet from being thoroughbred.
Old four-toed steeds are still on hill and plain ;
But life moves faster now ; and these must gain
A speed more great, if they would hold their own
Against old foes that quicker paced have grown.
And forms indeed are here than they more fleet,
To judge at least by their more centred feet.
For beasts there are, whose fourth toe nigh is lost,
And middle toes have thriven at its cost.
Thus do the equines for the times prepare,
With toes more pulled together, as it were.
And though on scenes they live where might is right,
Yet flight its victories has no less than fight ;
And these the Mesohippi called will bear
The equine race through all its perils here.
Small Camel types, but rabbit-sized, and few,
That in the Eocene days here met our view,
Seem vanished now. But new forms here and there
Less dwarfish built, and longer necked appear.

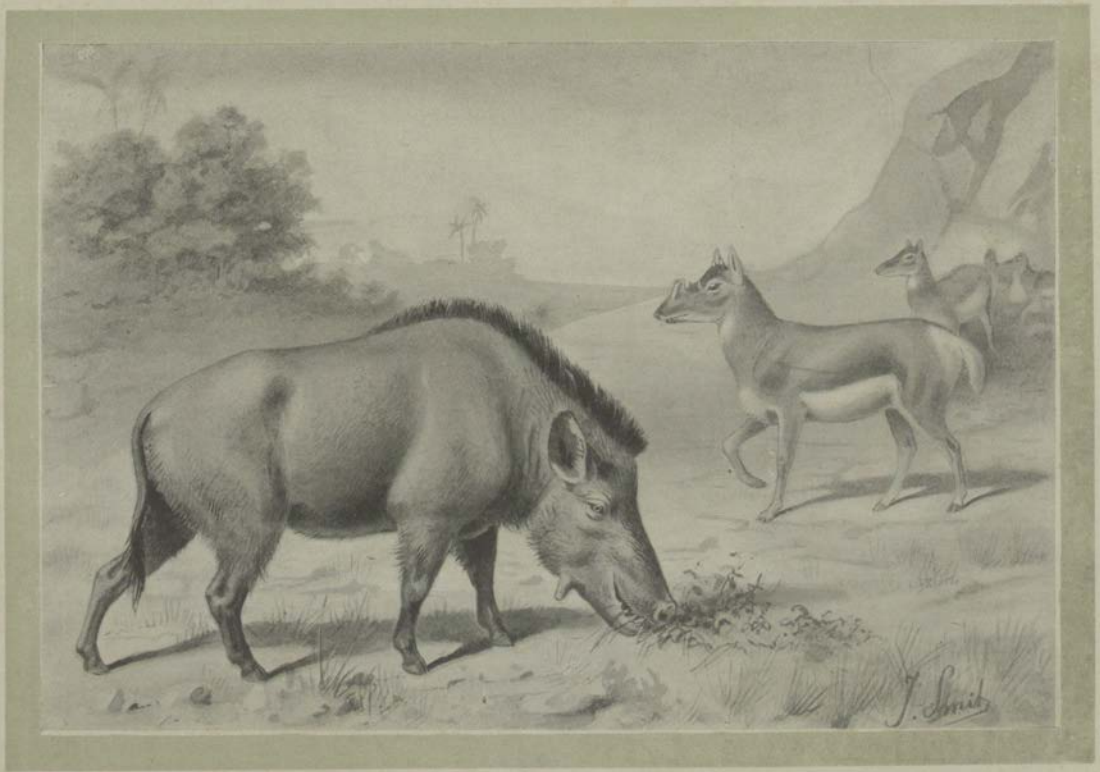
HYÆNODON

(Remains found in Europe and North America)

To face p. 133

Yet these new beasts can boast but little size,
For seem they most as deerlets in disguise
As lamas. But prosperous is the race
Though low down on the ladder be its place.
Carnivores here wend their butcher ways
Like to Europa's forms of Eocene days :—
Civets with teeth of dogs ; and forms like Bears,
Though sloping skull, shaped as the Dog's, be theirs.
Big cats well armed with canine teeth abound,
And bring with furtive spring their prey to ground :
And Dog-like brutes are hunting far around.
Beavers, that now for first time come in view,
About the streams their busy ways pursue :
Here too some bulky forms may be descried
That seem to Hippopotami allied.
Some Sheep-sized forms on land, though light of foot,
And graceful framed, are weaponed well to boot.
Though Deer-like beasts, they are related wide,
Being alike with Chevrotains allied,
And with Giraffes. Great is their horny pride.
Defenceless though the does, of horns no less
Than six a-piece the gallant bucks possess.
Between their ears two spike-like horns stand forth,
About the cheeks are knobs of horny growth,
And other horns just leave their nostrils free,
Whilst tusks below complète their armoury.

But though of shapely build, well armed and brained,
They have, as it would seem, their zenith gained :
Or may indeed have long since passed their prime,
For of them naught we know in by-gone time.
Nor distant now would seem to be their doom,
For little of them in the times to come
Shall we behold. Yet here they meet our eyes
As they had had adaptabilities
Subtle and great. But all adaptive powers
Must have their limits in this world of ours.
And these "Protoceras" forms must yield their place
To other life, as did the "Titan" race.



ELOTHERIUM

(Remains found in Europe and North America)

PROTOCERAS

(Remains found in Dakota, U.S.A.)

To face p. 134

MIOCENE PERIOD

VAST sway on land now holds the Midland sea,
But of her yoke are Asia's eastlands free :
And though her orient waters far extend,
No more with India's Ocean do they blend.
But much of northern Afric owns her sway,
And still, as lands subside, she ploughs her way
Europa through. And all low-lying lands,
Where flows the Rhone to-day, she full commands.
And northward round Helvetia's Alps she roams,
And on to where Vienna's spires and domes
To-day are seen. And other of her flood,
Leave the Carpathians isled in solitude.
But here and there big upheaved tracts pursue
Their upward course : and slc
Helvetia's northland comes : a
Glitter grouped lakes, in highl
Upheavals too compel German
To beat retreat from long held t ...ory.
Up through the blue slow comes a broadening plain,
And north Germania, long sunk, breathes again.

But whilst this briny foe has fallen back,
The Atlantic's " big battalions " now attack
Francia's south western coast ; and by degrees
Flanking by northern route the Pyrenees,
Push on their way, despoiling fertile lands,
To find, by narrow strait, the Mid-sea strands.
Small change has Britain's coast line undergone ;
For little land has here been lost or won.
But on her breadths have rivers writ their tales,
And changed the levels into hills and vales ;
A feature giving to the yielding rock,
As does a sculptor to his marble block.
h Erin's northlands, earthquakes now are sending
rending

'Neath hardening lava,
Subsidence, uplift, rivers, seas, and clime
Will change the scene, as run the sands of time ;
But Erin's Giant Causeway, and the isle
Where Fingal's Cave betrays the columned pile,

Remain to-day, and grimly testify
The mighty havoc wrought in days gone by.
A genial clime still fills Europa's zone,
And little change has plant life undergone.
Indeed though now and then some waves of cold
Had swept from far north realms in days of old,
A genial clime for most part had embraced
The wide wide world, through all life-periods past.
And now in Miocene times, on arctic land,—
Where ice and snow to-day hold wide command,—
Are beeches, oaks and walnuts spreading far,
And limes and elms and soft magnolia.
But to Europa changes come in time,
And cooler airs sweep oft her genial clime.
No longer now can palms retain their place ;
But grasses, reeds, and sedges grow apace ;
And trees deciduous greet the bracing air,
As breath from friends on native heaths afar.
Marsupials here no longer now abound ;
Though in the woods opossums still are found ;
Indeed the " pouchy " groups seem disappearing,
From all haunts here, as though disasters fearing.
Nor yet, in time, in Asia will they live,
And Afric's land will no asylum give ;
But live they will, and Austral regions far
Will long befriend them, and America.

Both great and small, in spite of civil wars,
Wide through Europa range the carnivores :—
Ferocious creatures, as it were let free
To eat their way to world-wide mastery.
Old civet-bear-dog forms of times long gone,
In spite of evolutions, still live on.
But though these forms ancestral still survive,
With larger hopes ahead their offshoots live ;
And here such forms indeed already thrive.
For rid of old associates dogs are here ;
So too is seen the long foreshadowed bear.
Small he may be, but oft in small way start
Ambitious lives, that on new lines depart.
As living agents from the halls of Death,
The Cat-like tiger forms with tusky teeth
Are rampant now ; and well may horse and deer
On tiptoe speed, when such grim forms are near.
Of ancient Horse-like breeds but few are found,
Though still the Anchithers, so named, abound.
But these though numerous now, and bigger too,
Seem not on lines that lead to Horses true.
(How oft in Nature from one stock arise
Groups that await wide different destinies.)
Some smaller forms, the Hippotheria called,
Seem now as in the foremost rank installed.

And though these creatures "extra" toes possess,
These toes to ground seem scarcely now to press.
For Aaron rod like is the central toe
Absorbing them, and doomed they are to go.
And with feet more compact will come more speed,
And greater safety in the hour of need.

Hornless Musk-deer-like forms still meet our view,
But deer are now abroad of fashion new,
Small deep-forked horns upon their heads are growing,
(As Muntjacs have), as Nature were bestowing
Some means to meet conditions near at hand,
That promise little peace throughout the land.
Here too on plain and hillside live and thrive
Creatures, that though of structure primitive,
Are leaving Deer-like ranks to launch the throng
To which sheep, oxen, goats, and antelopes belong.
Small antelopes these creatures most appear,
And like their Muntjac looking cousins here,
They too have horns; and these, though small and slender,
In love and war will useful service render.

Big Mastodons, four tusked, are on the scene,
Resembling forms that here of old had been.
Yet some there are that bear in tooth the sign
That they are working into closer line
With species of to-day. Here too there range
Some tusky trunky brutes of aspect strange.

These Dinotheria named seek lake and stream,
Wherein their down curved, walrus tusks would seem
To be of service both to uproot plants,
And act as hauls up high-banked watery haunts.
And though not placed for freedom in their play,
These tusks may prove effective in a fray.
But though these forms to elephants pertain,
Their line will never to that rank attain,
Nor will it till the coming Age remain.
With different fortune moves the Mastodon:
And he the chosen is to carry on
The trunky race. And from his loins will come
True elephants, that far and wide will roam.
Nor in Europa only does he stray,
But far to west and east has found his way.
Forward have now rhinoceroses pressed,
And of the times are keeping well abreast.
Whilst some are hornless, as their fathers were,
Some now with single horns equipped appear:
And others are that two horns now display,
As does Sumatra's small sized breed to-day.
Wood-beetles, ants, and other insect broods
Europa through, in countless multitudes,
Are, it would seem, in numbers overgrown,
And here must new life come to keep them down.

ANTHRACOTHERIUM

(Its remains are found in Europe, India, and North America)

DINOTHERIUM

(Its remains are widely distributed in Miocene deposits of Central Europe, but have not been found in America)

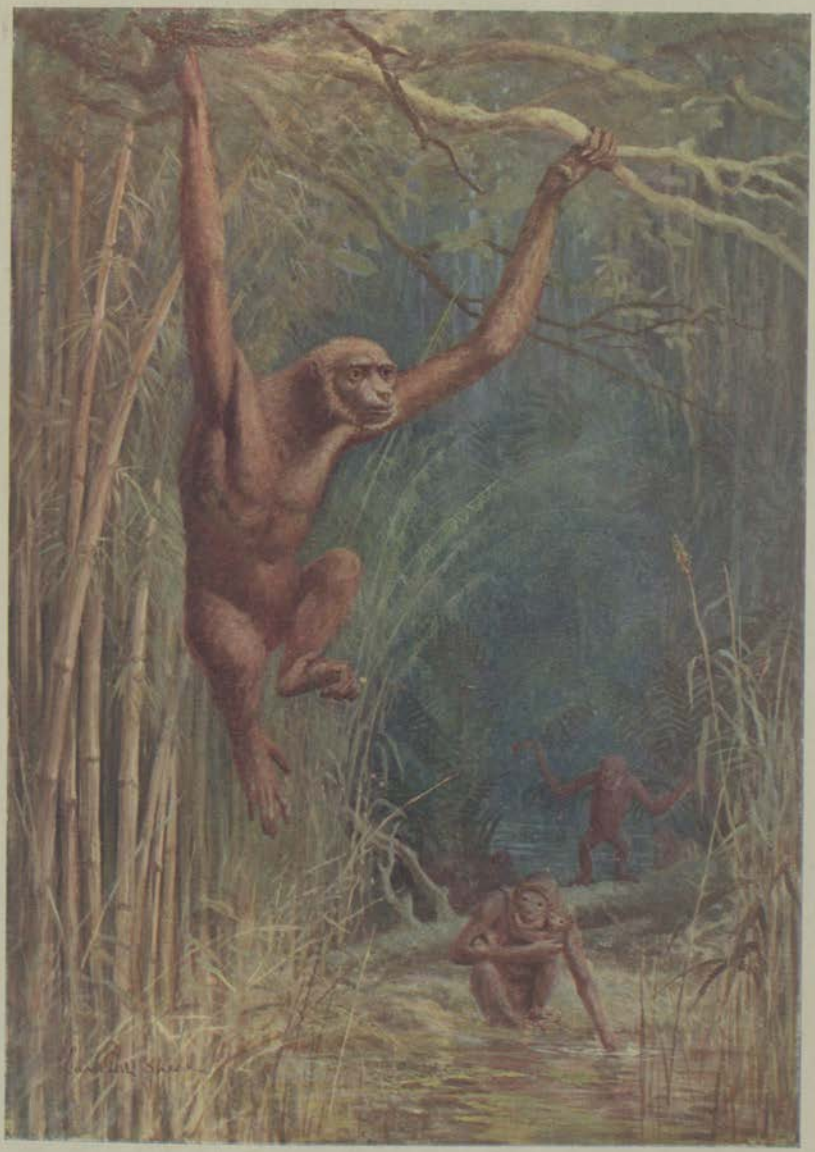
To face p. 140

Some forms, perchance, in Tillodonts inmated,
And to Ant-eaters and the like related,
Now haunt the scene ; and keen with claw and tongue
Soon make their presence known and felt among
The fertile swarms, though "legion" be the throng.
Alike maybe from Tillodonts derived
Are creatures here, that have in time contrived
To found a family ; or at least are giving
Promise of such. For these new forms here living,
Judged by their teeth, seem over ancient lines,
And on their way to true formed Porcupines.
Nor will the little creatures tamely yield
To butcher brutes, that seem to hold the field ;
And many a tiger form, in times ahead,
Progged by their spines, will slink discomfited.
In Lemur ranks clear has the cleavage grown,
And in distinct and bold relief are thrown
"Stagnants" and "Progressives,"—those on the way
To higher planes, and those condemned to stay
In Lemurage ; and be by Nature there
Slow crystallised, or ear-marked as it were.
And now by clime compelled, and apes maybe,—
(And relatives not always do agree)—
Lemurs forsake Europa's territory.
But far away in Africa's domain
Haunts will they find : and still some pride retain.

Though will they there be hustled for long whiles,
Till Madagascar and the neighbouring isles,
Once one with mainland, will afford their race
A last and isolated resting-place.

Already some divergences have come
Amongst "progressives" of old Lemurdom.
To monkeys and baboons some forms seem tending,
Whilst others, more developed, seem ascending
To rank of man-like apes; as they might be
Of apes and man a common ancestry.
See here the while his consort laves the child,
Proud Pliopithecus in antics wild.
Though chimpanzee he be in point of size,
With gibbons holds he close affinities.
And may not stock as this, in times ahead,
Split and re-split, outstriking lines that lead
To gibbon apes, gorillas, chimpanzees,
Orangs and Man, as separate families?
(For apes developed as to-day we see
Ne'er stood direct in human pedigree.)

Continuous uplift now has made secure
Columbia's big broad lands from shore to shore;
And cooler made the long warm temperature.
But not as yet along the south east coast
Has all the land, that in times past was lost



PLIOPITHECUS

(Remains found in Miocene strata in France)

To face p. 142

Recovered been : and Florida to be
Still, as in Creta times, lies in the sea.
High lands in Colorado now are seen,
O'er which the sea in Creta times had been.
Across their breasts are rills and rivers racing
To lower levels ; carving and defacing
The rocky mass. And great in time will be
The sculpture work now in its infancy.
Down through the plateau mass, by night and day,
The streams will cut, as saws, their deeper way,
Till from low levels gained, the cañoned land
Will as some huddled hills converted stand.
High rise the Rocky Mountains in the west,
But huge volcanoes, never long at rest,
Along the western slopes, in ruddy wrath,
'Neath lurid dust-black skies, are pouring forth
Vast streams of liquid rock. Luxuriant plains,
As were let loose hordes led by Tamerlanes,
Are overrun, and from the scoured lands
Must life retreat, or perish where it stands.
    But room enough there is ; and far and wide
In other parts, smiles Life in all her pride.
Though with them vie the alders, oaks, and elms,
And other migrants from the northern realms,
Vast piny woods, with Giant Redwood trees.
Still hold their own through regions measureless.

Unchecked as yet by Man's controlling hand,
Rampant are carnivores up and down the land:
In form, resourcefulness, and strength excelling
All previous kinds that ever here were dwelling.
Ferocious dogs of vague and general form—
As from their ranks some divers breeds might come—
Hunt through the woods, and up the mountain slopes
The startled herds of deer, and antelopes.
Legions of Cat-like forms, both great and small,
But still in structure vague and general,
Here prowl and growl. And in the groups around
Lions half-formed, and tigers may be found.
And these fierce creatures, with the canine host,
Seem now to rule the land, from coast to coast.
The Horse-shaped creatures of Rhinoceros race,
Hyracodons so called, no more we trace.
Little indeed of Lemur life we find,
And for the time it may have dropped behind.
Yet here some forms are seen, and these appear
As they to Man-like apes were drawing near.
Amongst the Pig-like brutes whose lines are cast
In these wild scenes, some members now have passed
To forms less vague; and some of smaller size
Appear as they were little Peccaries.
And for defence close-herding oft they may
Keep fierce flesh-eating enemies at bay.

Creatures to Sloths and Ant-eaters akin,
And Armadillos, haunt the busy scene :
And poor in teeth must on their claws rely,
When fortune drives them to hostility.

Nature has marked this western hemisphere
To have, in time, its native breeds of deer ;—
Forms antlered, skulled, and forelimbed different
From those of any "Old World" continent.
And of peculiar breeds that will appear
(Brockets, Virginian, Musk, and other deer),
The parent stock would seem already here.

The forms with Camel points of days gone by—
Quaint Fox-sized beasts—have here posterity
Of larger build : but long must strive the race
Ere it attain in life more sure a place.
Indeed the Lama seems in these to blend
And these a stock may be, whence will descend
Camels and Lamas : for still is Nature rife
With many vague and general forms of life.

Some bulky mastodons are here freebooting
About the woods ; and shrubs and trees uprooting
With tusky zeal. But prosperous though they fare,
They too of carnive risks must take their share.
For weight, and trunks, and tusks, and good sized brains
Will not immune them in these fierce domains.

Rhinoceros forms like those of Eocene days,
Hornless and four-toed, no longer wend their ways,
As it would seem : but forms more close akin
To those that live to-day are on the scene.
And though of new forms some may hornless be,
The toes of such have dwindled now to three.
And some there are that on a long drawn snout
Have two small horns transversely sticking out.
But not these " new world " lands will ever see
The later fortunes of the family.

The while these various groups have thus progressed,
No less to states advanced have horses pressed.
More tall they stand, and forms here meet our eyes
That are as Shetland ponies as to size.
Yet in their teeth and feet they chiefly bear
Their signs of progress o'er the forms that were ;—
In teeth more finely wrought, and stronger crowned,
In feet with lateral toes well off the ground.
About the forests forms indeed we meet,
That wend their way on spreading three-toed feet :
(And as through marshy woodlands wide they rove,
Oft will expanded feet a safety prove.)
But not these forest dwellers hold the place
Of chiefs and leaders of the equine race :
But to the forms that o'er the open plains
Had wandered far that dignity pertains.

These though exposed to meet more frequent fate
From divers Dog-like brutes insatiate,
Had richer pastures found, and speed had gained
More great than those that had in woods remained;
And can, when pressed, extend with race horse pace,
And show clean heels to yelping packs in chase.
Three toes indeed upon their feet remain,
But lateral toes scarce any use retain.
See Protohippus here, full stout has grown
His middle toes, as he for long had thrown
His whole weight there, dwarfing the side toes more
Than e'er was seen in kindred forms before.
With Pliohippus side toes nigh are gone,
And merely hang as useless splints of bone.
But farther progress must these creatures make
Ere they the rank of true equines can take.
Thus in Columbia does the new life thrive:
And live not groups from which man will derive
In times far off, when he has joined the strife,
Fast friends and helpers for his daily life?
The whale-like Zeuglodonts that off these coasts,
In Eocene times, pursued the finny hosts,
Are seen no more: but forms in tooth allied,
Though skulled more as the Dolphin, swim the tide.
Others, in one jaw only, teeth possess,
As with the Sperm-whales: others retrogress

Still more; for all their teeth are sloughed away,
As with the toothless "Whalebones" of to-day.
Thus has degraded life, that in back days
Forsook the land to haunt the watery ways,
Of more degenerate signs become possessed,
Or rather has slow downwardly progressed.
Across the line the southern continent,
Increased in Carbon times to great extent,
Now higher lies; and with a breadth more wide
By uplifts pushing back the eastern tide.
Indeed the eastlands here and there outstretch
Three hundred miles past where to-day they reach.
About the wilds carnivorous creatures rove,
But few of these appear to rise above
Marsupial state. Whilst hoofed beasts wander here,
The Toxodons so named, not known elsewhere.
But sloths and ant-eaters seem most to thrive,
And armadillos—all these here countless live.
Whilst flat-nosed monkeys here and there are found
To give a tone, as 'twere, to life around:
Seeming indeed as they had crossed the seas
A light to bring, as might some missionaries.

TOXODON

About 9 feet in length

(Remains found in Buenos Aires)

To face p. 148

PLIOCENE PERIOD

BRITANNIA, carved to hills and vales and plains,
With Scandinavia, as of old, remains
Contiguous. And though the cold north main
Knocks at the gate, it knocks as yet in vain.
And battered, but unconquered, land afar,
From Greenland's plains to Scandinavia,
To its advance still stands effective bar.
The German sea that had o'er Belgia swept,
And on Britannia's south-east terrane crept,
Has here and there up country further strayed,
And bigger gulf within Britannia made :
And part of Suffolk land of time to be
Is lying tens of fathoms in the sea.
Old chalky plateaus, on the southern strand,
Still hold Britannia linked with Francia's land.
Warm are the waters of this land-locked sea ;
Warm-climate mollusks live here prosperously,
And ill could they the shock of change sustain,
Should cold north waters enter their domain.
The Midland sea, that long had far and wide
Europa ploughed, has now indrawn its tide,

And given the old, and oft swept, continent
Earnest and promise of outline and extent,
As of to-day. But not yet wholly free
Are all the southlands of invading sea.
Hispania not as yet has, as it were,
Shaken herself dry ; and waters still career
On south Italia, though be they shallowing here.
In part is Grecia too held by the sea,
But far to east outspreads her territory
To Lesser Asia's land ; binding in one
The numerous isles that greet to-day the sun.
Still with soft foliage is Europa green,
Though change is creeping slowly o'er the scene.
Oft chilled is clime, once mild and uniform ;
And as hard driven ships before a storm
Must some life fly, and seek on other land
Asylum from the ills, that seem at hand.
Palms, long alive to changes in the zone,
From all Europa now are well nigh gone.
But in some southern parts bamboos are growing,
And tulip trees their lily blossom shewing.
Balsamic liquidambars still are here,
And laurels—rose and mountain—brave the air.
Not yet are cinnamons and cassias gone,
And twining smilax still can hold its own.

But all these growths, though long they here had thrived,
Have, as it were, their welcome now outlived.
And hardier growths—oaks, willows, poplars, planes
And conifers—are pressing their domains.
Indeed Europa now is laying aside
Her light apparel, as might an Ethiope bride,
Brought by a northern bridegroom to an air,
Where soft home breezes fail to follow her.
Brutes tusked and Tiger-like still wend their way,
Seeking by means more sly than brave their prey.
And some with little ease can eat their food,
So long and thick their "sabre" teeth protrude.
Bloodthirsty polecats, weasels wide awake
Hunt through the woods, oft killing for killing's sake.
The while hyænas—easier to please—
Regale themselves on rotting carcases.
Numerous though be the brutes with carnive jaws,
More prosperous seem the gentler herbivores.
And though abroad these oft must move in fear,
Still tooth and nail are not all powerful here.
In numbers great and much diversified,
About the woods and jungles, far and wide,
Roam herds of deer, in all their antlered pride.
And though the species here will pass away,
Close do they draw to tribes alive to-day.

Of new forms more, of old forms less remain ;
And threads are loosed from Nature's tangled skein.
Creatures, horned as the Muntjacs of to-day,
Their simple two-tined antlers here display
As in the Miocene times ; others are here
Whose growing antlers thrice-tined now appear.
And such new forms indeed may prove to be
Of Roe deer life the immediate ancestry
And old herds roam—though range they not so far—
Whose males and females both quite hornless are.
Horned antelope, as varied as the deer,
Explore the plains in growing numbers here.
Forms as of Miocene times are on the scene,
But longer horned : and others close akin
To Afric's long horned Oryx here we see :
Whilst some whose horns are twisted spirally,
More as the ox-like Eland's, now abound :
And true gazelles with horny lyres crowned
In goodly herds along the wilds resound.
Giraffes, long merged in antelope and deer,
Are leaving now old moorings as it were.
Strange bulky forms, with less of grace than strength,
On short stout limbs of nearly equal length,
Are now abroad. Long horns some forms display,
And shorter necked are all than those to-day.

But they, though fathers of giraffes to be,
Not yet from Elk and Antelope are free.
Old-time rhinoceroses still roam about,
But hornless forms seem well nigh weeded out.
And thick-jawed brutes, on Grecia's plains that feed,
May prove the sires of Afric's long-horned breed.
The Dinotheria named, those quaint trunked brutes
That with their downcurved tusks tore up the roots
Of plants in stream and lake, still hold their own ;
And some indeed gigantic brutes have grown.
Piping must one suppose their times to be,
If size bears witness to prosperity.
Yet now looms near the ending of their line,
And this their climax prophesies decline.
Perchance o'erfilled with good things in their day—
Abundant food and ease oft spell decay—
They fat are waxed, and are as Jews become
That wailing Jeremiah warned of doom.
The Mastodons, that in their teeth draw more
To elephants, have longer days in store.
Large forms now here seem well upon the way
To elephants true formed of later day.
And though four-tusked most creatures still appear,
Short are the tusks their underjaws now bear.
And some there are, from whose shrunk lower jaw

The tusks are gone, as though of use no more,
Giving the trunk more freedom than of yore.
Small pigs, allied to those that haunt to-day
The Andamans, about the woodlands stray.
And forms full twice as large here too are found,
Grubbing with snorting snouts the forest ground.
But not yet can these porky champions shew
The tusky wealth, the later breeds will know.
Some forms, of Zebra size, now on the land
Seem to proclaim true horses near at hand.
Still smaller are their lateral toes now grown,
The mid toe having made their strength its own.
Indeed these creatures' progress since the day
From Tapir ranks they slowly broke away,
And as a separate family took root,
Is written in their slow compacting foot.
But in Columbia has the equine name,
Long noised abroad, now leapt to further fame.
For here are forms whose side toes are unseen,
So shrunk are these, and bedded in the skin.
And these new forms we now may fairly hail
As horses true, and well within the pale.
Forms too there are, no longer pigmy size,
But high as horses of to-day they rise.
Yet will Columbia not in time retain
These home developed types in her domain.

HIPPARION

Standing about 13 hands

(Remains found in Europe, North Africa, Asia, and North America)

To face p. 154

Perchance to bloody carnivores a prey,
Clean from the scene will all be swept away.
Fine breeds indeed in time will graze her land,
But thither brought by Man's, not Nature's hand.
    Less numerous in Europa than of old
Seem ape and monkey forms. Perchance the cold,
Food scarcity, and brute force here portray
A scene, no Eldorado for their stay.
Yet still in favoured spots they find retreat,
On woody scenes, where balmy breezes beat.
In limb, at least, these beings macaques appear,
But both in tooth and skull they semblance bear
To India's langurs more, and well they may
Be close allied to those forms of to-day.
    Upheaval and subsidence ever rife
Are bringing changes o'er these scenes of life.
Increasing cold in regions to the north
Is driving life a puzzled pilgrim forth.
North waters now to southern seas are flowing,
And with increasing keenness winds are blowing
Across soft scenes, where Nature's fostering hand
Had brought forth life, as on a tropic land.
Ah! men to-day that fain would reach the pole;
Closing are now the gates that hold your goal.
For far away within the whitened zone,
An ice-king sits, hard frozen to his throne:

And higher will his circling ramparts grow,
And heavier lie his fields of garnered snow.

India, but seen as yet in fitful light,
Bursts now a panorama on our sight,
Bristling with life—and life that is ahead
Of what the western world so far has bred.
Varied is the assemblage she presents,
Ranging from mice and rats to elephants.
But how far she herself bred this array,
Or gathered it elsewhere, what man can say ?
Doubtless much foreign life had hither come,
And been improved in its adapted home :—
Worked into shape, as precious stones might be
Cut, ground, and polished by a lapidary.
Still many groups of life may well have been
First, if not here, at least on Asia's scene.
But be that as it may, yet is it true
India first brings much modern life to view.
And of the genera here within her fold,
Half are the same as what we may behold
About the world to-day. And 'neath her sun
It is that Nature's van seems marching on.
But still does she amongst her life display
Old forms not few that time will sweep away.

Plump dinothers, in pride before their fall,
Feast with the threat of "Mene" on the wall.
And mastodons, in this their eastern home,
Are passing, like old fashions, to their doom.
(And though old fashions be revived by men,
In Nature gone, they never come again.)
Yet from their ranks have Stegodons come forth,
That in resource and strength have proved their worth;
And that in tooth at least can show advance,
That brings them more in line with elephants.
Yet destined are they to decline and fall,
Being indeed but forms transitional;
And are as one by birth of low degree
Who garners wealth to found a family,
And is himself lost in obscurity.

And now from these rough diamonds of the past
Are shining forth true elephants at last.
Some lordly forms about the land we see,—
A self-made Nabob aristocracy,
Sprung from the ranks by merits of its own,
The Mastodon above, and Stegodon.
Some forms amongst them, higher skulled, must be
Of India's breed to-day the ancestry.
Whilst some with skulls less high pitched seem as they
Were of the breed in Afric found to-day.

Great times await this tusked and trunky race,
In many lands will they exact a place;
And branched in species will they slow appear
In strength through east and western hemisphere.
    One-horned rhinoceroses here foretell
The species that to-day in Asia dwell.
Others there are, whose front teeth all are gone,
But who, instead, possess a second horn:
And these, thus armed, may be the parent source
Of Afric's huge square mouthed rhinoceros.
    Forms Pig and Hippopotamus between,
(Congeneric with the species that had been,
Far back as Eocene times, in marsh and mere
Upon Europa's lands,) are living here.
But on their last legs now their ways they wend,
As pensioners of Nature, near their end;
As ones whose part is played; whose strength out-spent
Has nothing left for more development.
For here around them does the country hold
Both branches of the life their stock foretold.
Time's river, as it were, has rent in twain
An ancient rock, that ne'er can join again.
    But "river-horses," though in force indeed,
Are few compared with divers pigs that feed
About the land. These, some in size as hares,
Others, mule-big, crowd thick in jungled lairs.
Of wart-hog breeds, and India's tusky boars,

Here live and thrive the sturdy ancestors.
Others as pigs of Andamans would seem:
Whilst some may be the little parent stream
Of pigmy hogs. Indeed throughout the east
Is multiplying fast "the unclean beast."
Primeval deer, as in Europa's clime
Had lived and vanished in the Miocene time,
Still live on here. Short are their tusks now grown,
But antlers—small as yet—their foreheads crown.
And deer are here that quainter looks possess,
And are, as musk deer, tusked but antlerless.
With these ancestral types, new forms are here
That with to-day's Swamp deer congeneric are.
Long pointed antlers can they proudly boast,
Changed for the canine tusks, that now are lost.
Forests of horns indeed are in the land,
And no millenium here is near at hand.
Antelope of various species meet our sight,
Through wood, and plain, to mountain's giddy height.
Forms like to those that in these Pliocene days
Are in Europa here pursue their ways.
Gazelles are here as there, in all their pride,
And kindred tribes to Oryx close allied,
Kudus and Elands. Yet more varied are
The many forms that here range wide and far.

Some Water-bucks and Black-bucks here are seen ;
And forms to Hartebeasts and Bontebocks akin,
And Nilgais are in view. Yet times will come
When antelope but few these scenes will roam.
And in Europa none will find a place,
But Afric will befriend their wandering race.
    But though in time this life must, as it were,
Draw in its horns, Europa through and here,
Yet far and wide will thrive in times to be
New forms offshooting in the family.
For though the antelope were first to rise,
Yet did their vague mixed stock much else comprise.
The goat, the ox, and sheep were latent there,
As in one stock lurked civet, dog, and bear.
Great has the course of evolution been,
Judged by the creatures here on India's scene.
Goats, bison, oxen, early buffaloes,
And pristine sheep, that browse her lands, disclose
That long indeed must Nature, screened from sight,
Have toiled, by steps and shiftings infinite,
To bring such finished forms as these to light.
    Horses of latest fashion here are found
About the plains : whilst here and there around,
As old-time houses in a modern street,
Forms still remain, of structure obsolete.

SIVATHERIUM

(Remains found in the Siwalik deposits of India. The animal was almost as large as an Elephant.)

To face p. 161

Small chevrotains, tusked animals that bear
Affinities to camels, pigs, and deer,
And that indeed had in the Oligocene
Amid Europa's life foreshadowed been,
Are numerous now. Here too are camels passed
From dubious states, and at their goal at last.
As in the west giraffes, that more or less
Features of elk and antelope possess,
Frequent the scene. Here too allied forms live,
Short-necked as all their brethren primitive,
But who upon their massive foreheads bear
Flat spreading horns, whilst lower down appear
Two other horns, spike-like as brockets' are.
Big brutes are these, and with the mastodon
In limb and skull they bear comparison:
Though of Giraffes they bear in tooth the sign,
To Antelope and Ox they more incline.
And if these *Sivatheria* semblance bear
To what Giraffes in early stages were,
Well parted seem the ways that once were near.
Bandicoot and bamboo rats, in countless hosts
Throughout the land, the Rodent Order boasts.
In grassy lairs, and sunny warrened ground
Prolific hares and rabbits wide abound.
And porcupines their way have hither found.

If safety be in numbers, then indeed
Salvation for the Rodents is decreed.
Old forms amongst the carnivores are seen,
Like those that in Europa long had been—
Dogs, weasels, bears and otters. Here around
Are also brutes long quit of western ground.
No longer seen elsewhere, here still can live
Quaint Creodont forms, flesh-eaters primitive.
In various states of evolution roam
Hyæna forms, and true formed beasts are some.
Indeed the fathers of the spotted kind,
That live to-day in Afric, here we find.
Beasts Tiger-like with "sabre" teeth are here,
As on Europa's scene did first appear
In times far back. And savage forms more new
Of Cat-like build here also meet our view.
Tigers and Jaguars, living in one skin,
And forms like Leopard-cats are on the scene.
And badger-like Ratels, short limbed and strong,
Increase the roll of India's butcher throng.
The reptile life—the life that once indeed
Of all creation held awhile the lead—
Is here in force, though of its place deprived
For long by mammals from its stock derived.
Garials, as in the Ganges lurk to-day,
Does India boast: and some great brutes display

MACHÆRODUS.

(SABRE-TOOTHED TIGER.)

To face page 162.

A length of three score feet. Here too reside
Crocodiles to so-called "Muggers" close allied.
Long lizard forms, resembling Monitors,
Pass placid hours on the sunny shores.
Land tortoises of various kinds abound,
As they had here a happy feeding ground.
And on some scenes to giants are they grown,
And shells six feet in length some creatures own.
In streams and lakes, and shallows off the coasts,
(Where now cat-fishes seem of finny hosts
The most to prosper), cormorants are seen
And pelicans; (breeds both of which had been
Long in Europa). Mergansers, that as yet
Have not our eyes on western waters met,
Here seek their prey. Ostriches, close allied
To forms that stalk to-day the deserts wide
Of Afric, does India too support;
And storks to her, of western form, resort.
About this moving scene perchance there is
Bird life more frail and beautiful than this,
Earnest of that which after will arise,
But if such be 'tis hidden from our eyes.
Developed more are Nature's primates here
Than those rude forms our eyes have seen elsewhere.
The Langurs seem as western forms the same,
(And those there seen perchance from Asia came.)

But macaques and baboons, on India's scene,
Have more than western forms developed been.
And man-like apes to higher states have pressed
Than those vague forms that sojourned in the west.
Orangs indeed seem here, and chimpanzees,
Creatures to Man with close affinities.
And other forms of higher mould and mien
Than are these apes are found on Asia's scene.
For beings there are to Man slow drawing near,
In skull, and tooth, and limb ; and that appear
More ape-like men than man-like apes to be,
And rude forerunners of humanity.

Whilst thus has India's life far travelled on,
So too her land has changes undergone.
Young Himalayas, that in Eocene seas
Pushed up their heads, and caught the balmy breeze,
As giants now have bade the brine farewell,
Though at their feet may roll the angry swell.
Thus have mite-hosts, long low in briny shrouds,
Rest other found, and that amongst the clouds.
To rhizopods and nummulites indeed
Were tombs of grander character decreed
Than Egypt ever will, in times ahead,
In reverence rear above her regal head

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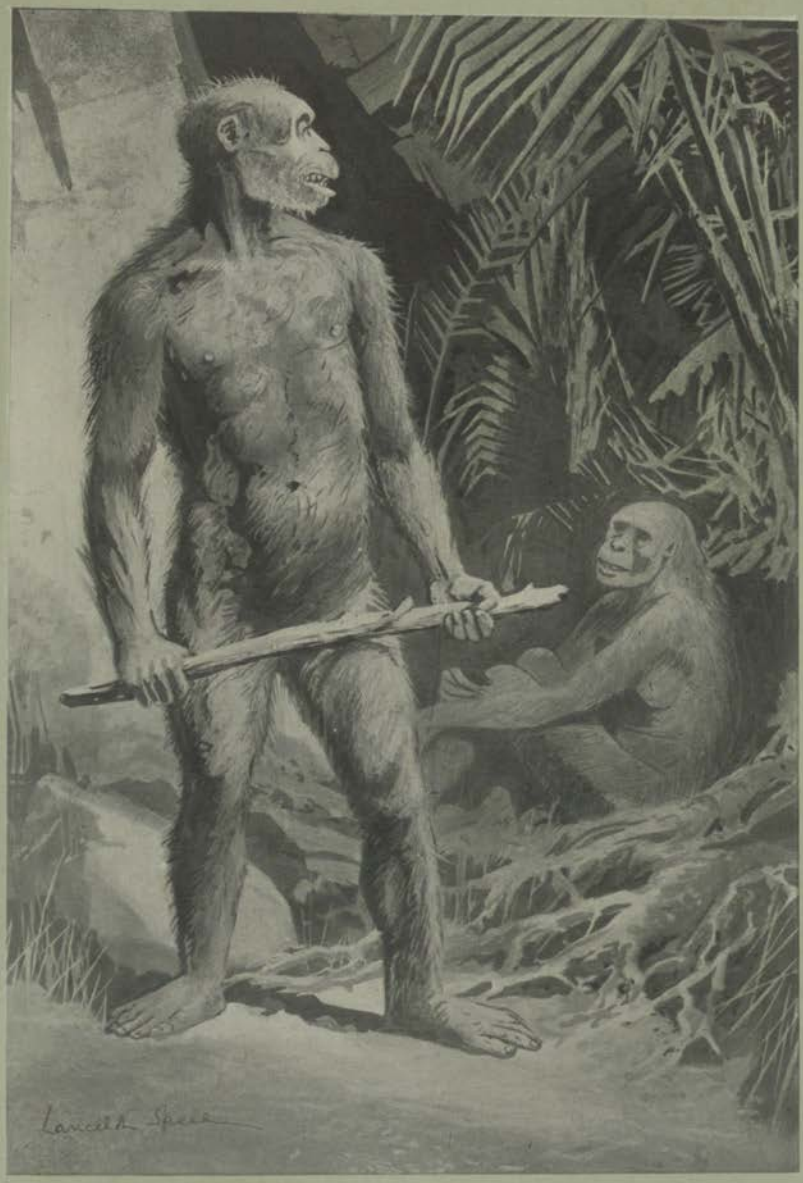


PITHECANTHROPUS

From very imperfect remains found in Java, in volcanic ash which also contained remains of Pliocene Mammals.

To face page 165.
Reference line 385.

PLIOCENE PERIOD

The southern lands of Britain now are seen
Upraised to loftier levels : land between
Francia and her is also higher lifted ;
And more to north the southern coast is shifted
Of that old German land-locked sea, whose strand
Had stood for long within Britannia's land.
But not locked in by land is now this sea,
For land upon its northern boundary,
(Land that for long long times had lain be-linking
Britain and Norway), now from view is sinking.
And this erst inland sea, now northward free,
Creeping across the sinking territory,
Has met and joined the chilly Northern sea.
Nor here alone have those cold waters come
Far from the rigour of their arctic home,
For that old land that long their bar had been,
From Scotia's land to Greenland's distant scene,
Is one no more : and Faroe Isles to be
Now lie a lonely land-mass in the sea ;
Along whose flanks the northern waters sweep,
And blend their currents with the Atlantic deep.
The Midland sea that in the times of old
Did oft Europa's southlands seize and hold,
Yet by upheavals oft had been compelled
To quit what through subsidence she had held,

Is still retreating : and the coasts betray
An outline more as that we see to-day.
But still with Afric is Hispania joined,
And still with Asia Grecia is combined.
On either side the sloping Apennines
Uplifted land has stretched Italia's lines.
Yet as in wrath for land that she has lost,
The sea has roused up Vulcan on the coast.
Etna and Vesuvius now are rearing
Great cindered homes of fire, domineering
The neighbouring lands. And long must Life await
Her chance to clothe these regions desolate.
With old lands gone that barred the northern sea,
Great must the changes now in sea life be.
From far old arctic haunts molluskan hosts
Are working down towards Europa's coasts.
And many groups that here had thrived of old
Must southward move, or perish of the cold.
Whilst seal and walrus to the south can roam,
And here indeed have some already come.
More cool upon the land has climate grown,
And on north scenes much plant-life is undone.
For save in sheltered places here and there,
No tender plants can breathe the changing air.
But firs and yews, and all deciduous trees
That here have braved the battle and the breeze

PLIOCENE HORSES

To face p. 167

For long times past, well found can fearless range,
And seem indeed to prosper in the change.
On fen and marsh new growths have taken hold.
Pondweeds and buckbeans, lilies white and gold,
With other growths from northern scenes arriving,
New colours to Europa now are giving,
Hoisting their flags as some exploring band
That has a footing won on new found land.
  Creatures, to horses shaping, oft have met
Our eyes about Europa ; but as yet,
Though in Columbia and in India seen,
No horses true have in Europa been.
But here now thrives the race, developed true,
And crude old forms have well nigh passed from view.
Far over grassy plain, and vale, and hill,
Wide rove the creatures at their own sweet will ;
Free as the air their opening nostrils draw,
Wild as the waves that toss their spray to shore.
Changed times indeed their progeny will see,
As to his will Man bends their energy ;
And varied be the parts they will sustain,
In bondage held, controlled by bit and rein ;—
To run the measured course at headlong pace ;
And tear along in maddening chariot race ;
To bear the knight, with spear and blazoned shield,
Or in the joust, or on the battlefield ;

To mount the hunter as he hawking goes ;
To chase the fox, and troll in circus shows ;
And harnessed be, alert at Man's command,
Or on the road, or on the furrowed land.
Ready in war, and toil, and sport, and play,
As Man appoints, to listen and obey.
But here, wild hearts, no bit is yours to fret,
Nor toil to know : your master tarries yet.

Hippopotami now breathe Europa's air,
Coming at least to spend their summers here.
Gone seem the dinothers to their long home,
But on the scene have elephants now come.
And in their ranks some bulky forms we see,
Forerunners of the mammoths, soon to be.
Some mastodons still here their ways pursue,
Though yielding is this "old school" to the new.
Rhinoceroses here and there still roam,
Though some, perchance, as visitors but come.

Antelope seem now unable to retain
Their old hold here ; but though this branch may wane,
More hopeful does the outlook seem to be
For other branches of the family.
Goats now are here, unseen in earlier days ;
And oxen here, then too unseen, now graze.
Musk-oxen also wander on the scene,
(Creatures that seem connecting links between

GIANT SLOTH (*Megatherium*), about 15 feet in length; AND ARMADILLOS

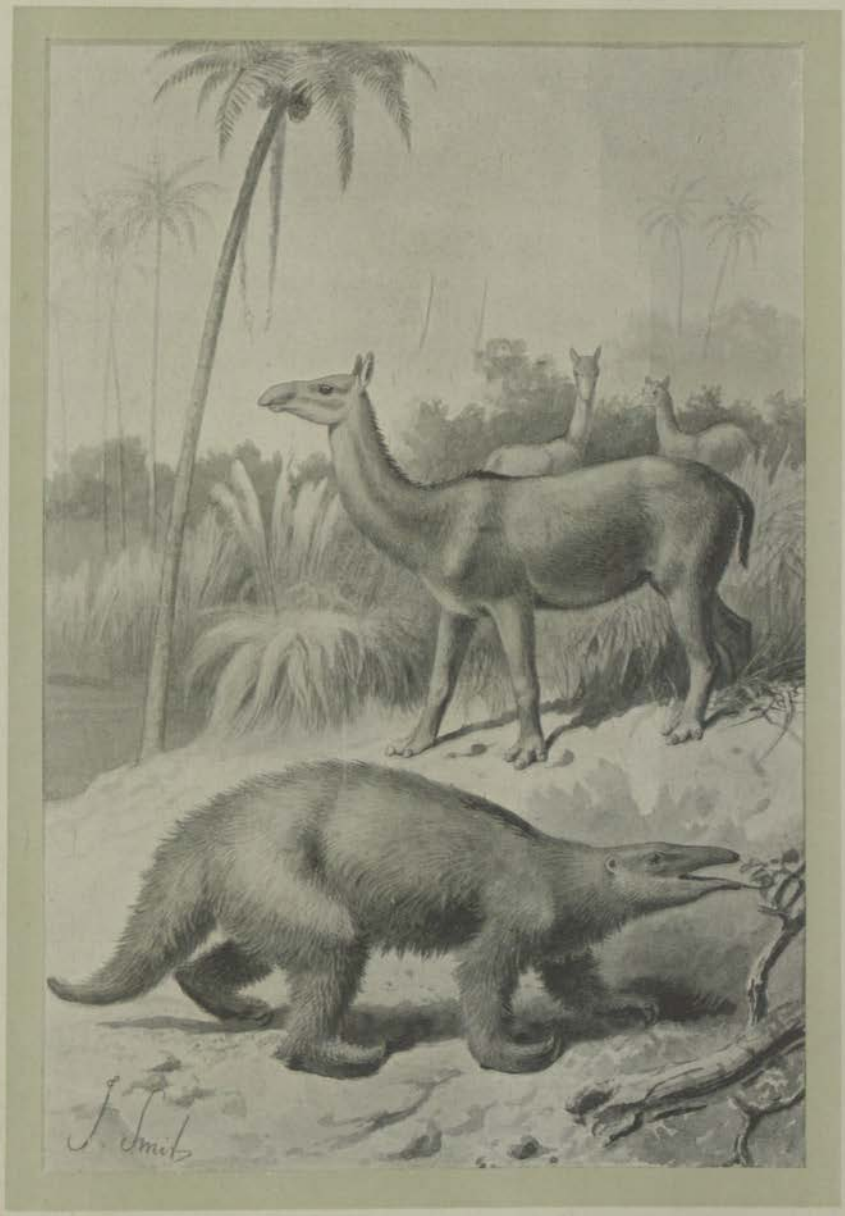
(Remains found in South America)

To face p. 169

Oxen and sheep,) and struck have they on lines
For favour marked, though not in these confines.
But of the groups of higher mammals here,
Not one has reached such fortune as the deer,
That better thrive than in the days of yore,
In spite of clime, and sharp-toothed carnivore.
Whilst thus the vegetarians fall or rise,
What progress show their butcher enemies?
Wild cats and lynxes now abroad are prowling,
Foxes and wolves. Hyænas nightly howling
Seem as of old: but lions erst contained
In vague cat-forms have now distinctness gained.
Brown bears are here, lords of the scenes they haunt,
Though they in time will humbler fortunes vaunt.
Will not their race be called to curious *rôles*—
To lift in dance their broad fantastic soles,
For sport of kings oftimes to baited be,
And taught to pole climb in menagerie?
Cave bears are also here, of stalwart frame,
And in Europa wide will be their fame.
But their great race will not survive to share
The ignoble part their relatives will bear.
No sign of man upon the scene we trace,
And if he lives, not from his hiding place
Has he yet come: indeed the whole world through
No higher forms than ape-men are in view.

Nor can Europa even apes command,
For they and monkeys all have left her land.
And Lion, Horse, Bear, Elephant, and Deer
Are now the five great powers dwelling there.

In life about Columbia's wide expanse
Appears no change of great significance;
But now and then about her northern land;
The arctic king has shown his shivering hand.
Not here is the rhinoceros now seen,
Though here had he in old times often been.
Perchance the somewhat dunder-headed brute
Found life conditions growing too acute;
And went to seek some easier land than this,
Where ponderous small-brained life might live in bliss.
Maybe he has in continental wastes,
South of the line, found quarters to his tastes.
There may he see some mastodons astray,
And horses also there may cross his way.
There too a curious creature will he find—
Horse, Camel, and Giraffe in one combined.
But as of old ant-eaters still appear,
With sloths and armadillos magnates there.
Indeed that group so prosperous has grown,
That special favour must it long have known.



MACHRAUCHENIA

About the size of a Camel

SCELIDOTHERIUM

Intermediate between Sloths and Anteaters, and rather smaller than the Brown Bear

(Remains found in South America)

To face p. 170

Huge armadillos there now meet our eyes,
That equal the rhinoceros in size;
And armoured well they are. Great sloths are there
That in their size with elephants compare.
Still size not always is an unmixed joy,
And oft makes Nature big the forms she would destroy.

What now of Austral that in times long gone,
Was cut from Asia, and its wealthy zone?
Forced has it been, within sea-girt confines,
To run its brute life on marsupial lines.
But though it move upon a lower plane,
Marsupial life can wondrous levels gain;
As here is proved. For pouched beasts we descry
Equal in bulk to Hippopotami.
Diprotodons are these; but not to-day
Like giants are seen. Other big forms display
Points that attest their destiny unfixed,
But seem they tapirs, kangaroos, and wombats mixed.
Here kangaroos of donkey size are found,
And so-called "devils"—badger-like—abound.
Wombats are here: marsupial lions roar
About the plains: hyænas gaunt explore
Dark woods and caves. Dogs, wolves and cats here thrive,—
Marsupials all—and little rats here live

That leap like kangaroos. Indeed howe'er
Hard pressed marsupial life may be elsewhere,
Here in its island haunts well does it fare.

Athough Britannia as of old still stands
With Erin one, and one with Francia's lands,
Uplifts and sinkings, through the land and sea,
Have slowly brought old Earth's geography
To outline nearer that to-day we see.
Though at much higher levels seem to stretch
The northern lands than what to-day they reach.
Yet has the re-arrangement, slowly fraught,
Not altogether unmixed blessings brought.
Already from our windows, as it were,
We see storm fiends gathering in the air.
Ah! Life, oft smitten through the days of yore,
More times of terror are for thee in store.

DIPROTODON.

Equal in size to a large Rhinoceros.

(Remains found in Australia.)

To face page 172.

QUATERNARY AGE

PLEISTOCENE PERIOD

EPOCH OF GREAT GLACIATION

GREAT cold has been, and sore has life been taxed,
Though now and then the grip has been relaxed.
But frigid clime, long fitful on the scene,
Has now in deadly earnest settled in.
Snow, snow, and snow: for ever it is falling,
Bedding, drifting. Cries piteous and appalling
From harassed life are rising to the sky,
And snow, snow, snow alone comes in reply!
Notice indeed had sounded through the scene,
And life migrations southward long had been.
Much has escaped from these conditions hard,—
But what of those that find all outlet barred
By mountains, drifts; or torrent streams, and seas
Not silenced yet beneath the icy breeze?
Looking around with "larger other eyes,"
Brute life, entrapped, forgets its rivalries;
And groups of divers creatures, here and there,
Are herding close, held by a common fear.

O Powers that be, why thus the life-cup fill
Of helpless brutes, that never wrought ye ill!
    Snow, snow and snow; frosts keener; thicker ice;
And more broad acres heaped with sacrifice.
Blind on its way, and silent, marches Fate,
Deaf to all sounds, unmoved by love or hate.
    Yet why should we on pain and misery dwell?
The sun shines forth, and all is seeming well.
Fitful and faint fall cries of last distress;
And comes not Peace to grace the wilderness?
    Thick is the snow high gathering centres bear,
Alike in east and western hemisphere.
Vast glistening fields for miles and miles extend,
Stretching to north as if they knew no end:
And rivalling in beauty and in pride
The whilom glories of the scenes they hide.
See how they glitter in the sunny noon,
As they were thick with diamonds bestrewn;
Will ever king to come, or fair princess
Put on a mantle, glorious as this!
    And life these snowfields have, life of their own,
Though strange compared with true life overthrown.
A font they are, as is a mountain lake,
Whose flooded site adventurous rills forsake.
Far from these parent fields of hardening snow
Are ice-streams creeping to the vales below.

Firmer and purer does their ice become
As move they further from their mountain home :
Till long drawn vales are thickly overlaid
With glacier floods, that seem of crystal made.
Dense beds of snow, increasing fast, now hide
Bleak Scandinavia's uplands far and wide.
All Scotia's highlands thick are covered o'er,
And vast on Erin's midlands is the store.
North hills in Albion too are heavy crowned,
And Cambria holds aloft as gathering ground
Snowdon and Arenig. Away to east,
The chains of Alps, with snowy mantles fleeced,
Groan with their weighty garbs. Whilst to the north
White Ural heights are rolling glaciers forth.
No less about the western hemisphere,
Great gathering grounds with piled up snow appear.
Raised lands to south and west of Hudson Bay
Are stacked with snow. Whilst far to west away
The Rocky Mountains, and the Cascade Chain
Threaten far lands, and e'en the western main.
Here then at these great centres snowy masses
Are mobilizing : and far through vales and passes
Will move the glacier columns, as to north
And south and east and west they sally forth.
Nor will all lands across the line escape,
And some in snowy outlines now must shape.

The Andes heights must bear their burdens here,
And Patagonia's plains will disappear
Beneath thick ice; and "greybeards" round the Horn
Will sweep along an ice-clad scene forlorn.
About big Afric too, in south and north
From mountain snows are glaciers streaming forth.
Nor are Australia and New Zealand free
From gathering snow. Whilst o'er the Southern sea
Antarctic lands, in barrier ice walls held,
Have bade farewell to all the outer world.

Time rolls along: and thicker lies the snow,
And from high homes innumerous ice-streams flow.
Great glaciers now along the vales have wound,
And, swelled with tribute from surrounding ground,
Are rising high, as though they would unite
Across the hills, and landmarks shroud from sight.
Indeed in Scandinavia such a scene
Now meets our eyes. Here have the valleys been
O'erblocked with ice; and glaciers hand in hand
Are stretching sheet-like over miles of land.
And great indeed in thickness have they grown,
Reaching in parts eight hundred fathoms down.
Slow it may be, but never motionless,
West, east, and south, the glacier masses press.
See here a mass slow working to the west,
To purest crystal, as it were, compressed.

A Frozen Sea

To face p. 176

Down to the rocky coast it travels on,
And even there its journey is not done :
But out to sea it glides, as it might creep
And makes its own the basin of the deep.
Yet as it boldly leaves its rugged coast,
Needs must it reckon with its ocean host.
(The host that had the fiords in time past held,
And from these ports had rudely been expelled).
And as to sea it moves, soon does it find
Itself in depths where it is undermined ;
And where by deepening waters upward pressed,
No more on solid sea-floor can it rest.
And now appears old Neptune's mighty hand
To smite and smash this venturer from the land.
Hard falls his pounding wrath, and soon around
With grating floes and bergs the coasts resound.
At points indeed, as if they saw their fate,
Their coming doom some blocks anticipate :
And from their lofty coast-line mass are breaking,
And straightway into sea great leaps are taking.
Weird is the scene. Ice shattered great and small
Of varied shapes lies off the littoral.
And throng it is that well may call to mind
A roadstead filled with craft of every kind.
Big battle-ships, big liners, as it were,
Barques, brigs, and yawls, rafts, row-boats, all are here.

Hulks helpless lie, held in the shallows fast,
And some there are to deeper waters passed,
Making for sea. Whilst some are far amain,
And port or coast will never see again.

Here further south, a brother mass in motion,
On Scandinavia's west, has reached the ocean.
But here it has a shallow sea to face,
That lacks the depth to undermine its base.
And on it drives its little hindered way,
As though it would its weight on Scotia lay.
But pressing on, it finds its way opposed
By other ice that has the sea-way closed.
Scotia with ice enough, and ice let free,
Already has a sheet far out to sea.
Thus sheet meets sheet, and erst united lands
Their bond renew, with icy outstretched hands.
With forces joined the mighty frozen host
Now bend their whelming way to Albion's coast.
No sheet is here that can their course withstand,
And down they press upon her eastern land.
Yet as they southward move by hill and dale,
Their early strength and firmness seem to fail :
And ere is reached where London stands to-day,
The aggressive host has dwindled nigh away.

From Scotia's highlands far to west have gone
Vast glaciers combined ; which pressing on

Across the site of Hebrides to be,
Finish their course as icebergs in the sea.
Another confluent mass to south has gone,
And joined the ice from Erin working down.
Then further south these meet the glacier flow
That down has come from Albion's western snow.
And further south moves on the swollen band,
And joins a glacier sheet from Cambria's land.
And thus is held the ground from side to side.
O'er which is seen to-day the Irish tide.
Still further south the junctioned masses bear—
An ice united kingdom as it were—
Till getting out of depth, and climate-worn,
They tell in monstrous bergs their southern bourne.
From Erin's central snow-collecting ground
In all directions have the glaciers wound.
Indeed in every part, from east to west
And north to south in ice she lies suppressed.
Meanwhile are other glaciers wandering far
On divers routes from Scandinavia.
Some far to north their glassy cargoes bear
Down sloping vales, coals carrying as it were
To Newcastle. Others south-eastward stretched
With facile steps have distant regions reached.
The Baltic basin has not barred their way,
And far o'er plains of Muscovy they stray.

Great other conjoined columns southward move,
And o'er the northlands of Germania rove.
But as to southward more their ways they press,
They slowly fail in weight and solidness,
And meet the fate their brother glaciers found,
As down they worked to Albion's southern ground.

But though the northern sheet is brought to bay,
Intact it still preserves its widened sway.
All northern land, from Erin's western coast
On to Europa's limits easternmost,
Lies underneath its weight: though here and there
Some lonely peaks, with wan lost looks, appear.
But not alone this weight of ice and snow
Does now Europa's once fair landscape know.
From chains of Alps, with untold snow supplied,
Gigantic glaciers, ever swelling, glide.
Far from their highland homes these now have passed,
Bearing their arduous ways, with backs crevassed
By lower sheets of ice that fail to move
In equal freedom with the sheets above.
And on they drive, as through the vales they toil,
Vast heaps of stone, and fertile valley soil;
And with their gathered weapons wear and scar
The rocky beds on which they trudge afar.
Well peppered are their backs with rock and stone,
That angry hill-gods from the heights have thrown.

And great the transport is in progress here,
Where blocks are borne, no river e'er could stir.
Why here are boulders two score feet in length,
The glaciers bear along with easy strength.
Indeed some blocks as good sized houses seem,
As though a street were going down the stream.
And far from native scenes will these be borne,
And in new lands as strangers lie forlorn.
Compared with its old giant ancestor,
The glacier of the Rhone is little more
Than dwarf to-day. See here its sire of old
Descending from its snowy mountain hold
In icy cataracts; and rising on its way
Higher a thousand feet than where to-day
Its pygmy heir can reach. On does it roll
Solemn and mute, a-stripe with stony stole.
Increased by glacier flows, that numerous glide
From Bernese Alps, along its northern side,
Vast does it swell; and larger grows the load
Of rocky débris on its back bestowed.
See here amongst its miscellaneous freight
It holds a rock, four thousand tons in weight.
And for a hundred miles its granite guest
Will be transported ere it lie at rest.
Then nearing land upon its southern side,
Where sits the great "White Mount" in all its pride,

North moves the ice. And now no longer bound
By shouldering hills, it spreads its wealth around ;
And as it had released from prison been
Raids, at its will, the lake and lowland scene.
Nor check it meets till Jura heights deny
Its entrance there on Francia's territory.
Not but it boldly seeks to override
The mountain range, and sweep its further side ;
And has indeed, by gaps and passes found,
Pushed columns out that reach the northern ground.
But not the higher ridges can it reach,
Safe as Olympus do their long lines stretch :
And though to push it on may ceaseless come
Vast reinforcements from its distant home,
Its way is barred. Yet not inert it lies,
Though baffled be it in its bold emprise.
Its forces now divided outward set,
Each to pursue its fortune separate.
That leftward turned, skirting the Jura moves,
And little hindered into Francia roves.
But here it is by rival glaciers pressed,
And cease it must to wander to the west.
South now it bends ; and naught impeded gains
The easy levels of the lower plains.
But dissipating here, on southern ground,
As though it had a fatal Capua found,

A wreck it lies. Meanwhile the brother force
To far more bracing scenes has bent its course.
Striking north-east it joins a kindred band,
That down has wandered from the Oberland.
For miles and miles the junctioned hosts extend,
And on to north a mighty ice-sheet send.

Meanwhile from lofty Gotthard's snowy zone,—
That forth had sent the glacier of the Rhone—
Another glacier, fraught with fate, has gone.
Away to east, upon a counter line,
Has moved this ice,—this glacier of the Rhine.
Down easy miles it draws its stately train ;
But further on is forced to bear the strain
Of northward bend. Grand is its volume growing
With tribute streams, from neighbouring valleys flowing.
Now in more open country, left and right
It spreads and onward glides : rolled out of sight
Are breadths of land and lake ; till on its west
It joins a confluent throng that here has pressed—
The band that in their mighty mass comprise
Rhone's beaten right, and since won close allies.
Creeps now the west front of the mingled force
To join Black Forest glaciers ; whilst across
The land of Swabia moves its eastern host,
To find itself in Danube's highways lost.

From other centres glaciers southward stray,
And near Italia's lakes their débris lay,
For climate here has brought them all to bay.
Whilst thus Helvetia, blocked from side to side,
Has sent her icy armies, far and wide ;
Francia has here and there been forced to groan
'Neath weight of ice, from snowfields of her own.
Nor is Hispania free. Though small's the share
These two support, compared with lands elsewhere.
And e'en Helvetia's mighty sheet out-sent
Is but a patch with what the continent
To north must bear. Indeed for most part lies
The whole land there as 'twere a sea of ice.
With half her land thus held in constant bond
By thick spread ice, and thin ice far beyond ;
And with keen airs that still more distant press,
Small charm for life Europa can possess.
No wonder old life groups that here had been
Frequent no more the inhospitable scene :
And far through Afric, and in Asia wide
Are seeking comforts that are here denied.
Deep down in ice, big forests lie entombed,
And growths beyond the ice-sheet have succumbed
To air they could not breathe. Trees there of old,
Kings in their way, are bursting with the cold ;
And once green plains are best but frozen mold.

Yet sheltered places are there in the land—
Oases as it were—where still can stand
Some forest trees ; though harassed by the ice
These oft no more than bush-size now can rise.
But arctic birch and willow, trained to cold,
Forced from the north, can now the southlands hold ;
And far to south are northern mosses hale
Seizing the grounds of stricken growths more frail.
So with the beasts ; though many are expelled,
By hardier life the quitted haunts are held.
Big bulky mammoths, clothed by Nature's hand
With hairy coats, explore the southern land.
From whilom northern pastures frozen out,
Rhinoceroses, " woolly " clad, are seen about.
Musk sheep and reindeer far to south have come,
And arctic fox and lemming hither roam.
And even polar bears will find their way
Far as Germania's land in search of prey.
Walrus and seal, about these scenes of yore,
Now far to south the chilly seas explore ;
And water mollusks, bred in northern spheres,
Are coasting down to join their pioneers.
Thus is Europa left as 'twere a host,
With many friends and boon companions lost.
But old friends once again will hither come,
As backward swings Time's fateful pendulum.

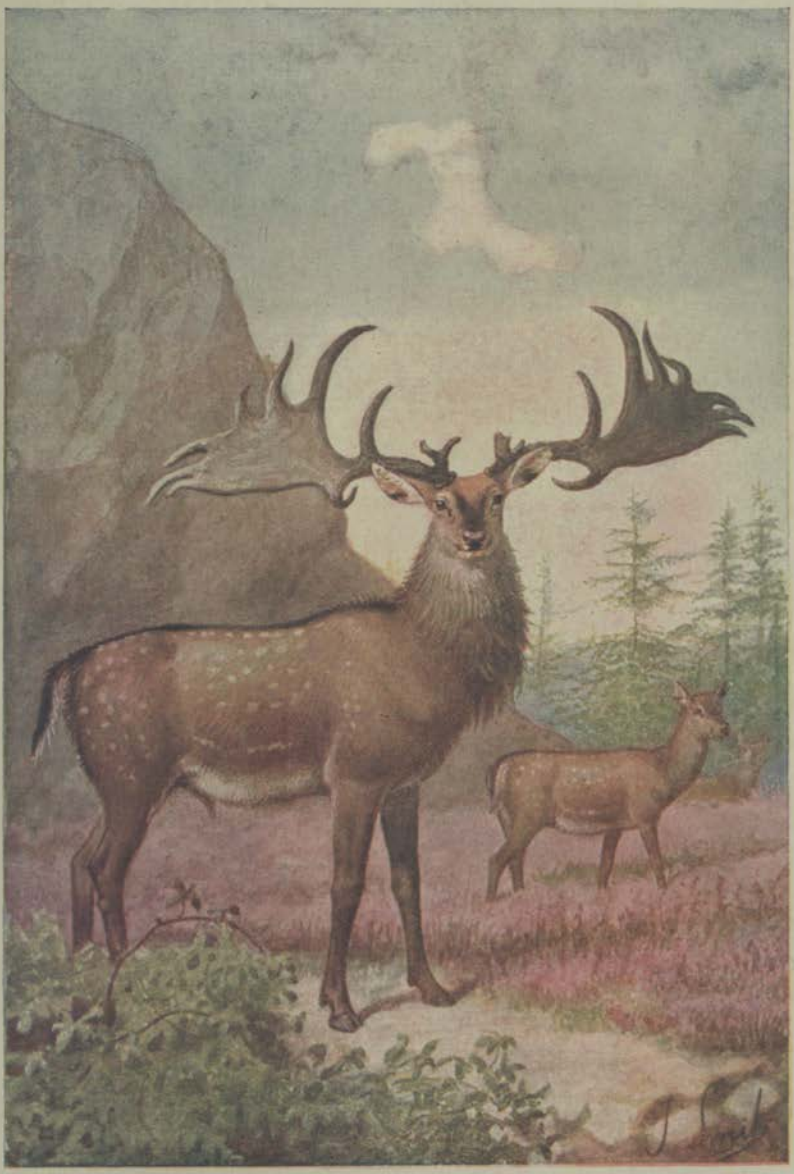
Sealed up in ice are regions wide and far
By glacier streams that frozen Canada
Has from her snow-fields sent. Nor yet alone
About her vasty landscape have they gone.
Columbia's north, by native ice oppressed,
Has felt their added weight from east to west.
Twelve states to be beneath thick ice lie hidden,
Their vales filled up, and mountain heights o'erridden.
All life that could the power to move command
Must long have left these scenes of stricken land ;
And well may Earth, if by her can be known
A strain from weight, beneath her ice-load groan.

AN INTERGLACIAL EPOCH

Truce now to ice, that through long years had lain.
Hail softer airs, that pledge "old times" again!
Europa, freed at last from monstrous ice,
With promise looms, "an opening paradise."
But long indeed must be her breathing space,
Ere she can wear again a smiling face.
For changed she is, awakened from her sleep,
And where of late were glaciers wont to creep,
Torrential streams, like vandal hordes let loose,
Or floods by forced or overridden sluice,
Are rushing down her vales; and on they sweep
With muddy freights, a tribute to the deep.
Great blocks of stone on rugged slope and tor
Attest the volumed glacier, there of yore.
Smoothed lies the land, and rounded far and wide,
And scratched and scarred, where glaciers rolled in pride.
And numerous lakes are here to tell the tale
Of ice that long had held plain, hill, and dale.
Poor footing yet can vegetation gain,
Where ice so long and heavily had lain.

And faced by cold that still vast breadths commands,
With faltering steps come growths from other lands.
But northern life that southward far had ranged,
Turns face again, amidst conditions changed.
And arctic birch and willow back are pressing,
And, with some hardy mosses, repossessing
Relinquished scenes ; and water-loving plants,
Long driven south, are seeking ancient haunts.

And as time runs, oak, alder, pine, and fir,
Lime, maple, hornbeam, poplar, juniper,
And other growths, that long had banished been,
From south return, and claim the steppe-like scene.
Musk-oxen to old pastures now are wending,
And reindeer track the mosses north extending.
Rhinoceroses, warm in " woolly " skins,
And hairy mammoths wander wide the scenes.
Wolves, bears, and badgers, as retreats the cold,
Push on to haunts, where thrived their sires of old.
And numerous other life, long kept at bay
By hostile clime, has northward made its way.
Elephants now breathe again Europa's air ;
Though mastodons, that once had thriven here,
Return no more. (Indeed it seems as they
From every " old world " scene had passed away.)
Rivers again, when summer heats run high,
Are far explored by hippoptami.



THE GREAT IRISH DEER

(*Cervus megaceros*)

Restored from remains found in Irish Peat Bogs

To face p. 189

Across the plains, regaining grassy pride,
Where their old sires had grazed, and multiplied,
Wild troops of horses wander far and wide.
Roe deer, with other breeds in back times blent,
Here now appear in full development.
Red deer are here,—a tribe till now unknown—
And proud with antlers long and massive grown.
But deer have come that bear the palm away
From these red deer, in antler-wealth display.
Stout-limbed they are, and head and shoulder stand
Above most deer, throughout Europa's land.
"Great Irish Deer" are these, though not indeed
Alone on Erin's pastures do they feed.
Upon their heads out-branching antlers rise
Of monstrous growth, alike in weight and size.
Ten feet and more spread these from side to side,
With looks of some huge fern fronds petrified.
Bison and oxen herds have now arrived,
From Asia's scene perchance, where long they'd thrived.
To howl and scavenge come hyænas back;
And lions, truly formed, are on the track
Of emigrating prey. And peace and war,
With their vicissitudes, obtain once more.
Fierce cold in fitful raids back still may come,
And harass life, advancing venturesome.

And to and fro life's movements oft must be,
As heat or cold obtain the mastery.
But held no more by constant ice in thrall,
And with clime-changes growing seasonal,
Europa, as of old, for far and near,
Holds now a varied life throughout the year.

But though returning warmth the scene restore,
Life here will different be from that of yore.
The old régime is gone ;—the state of things
When lions, bears, and elephants were kings.
A master force, a subtle influence new
Is here to leaven life, and through and through.
More nervous strength than brute life can command
Now plays a part upon this western land.
For here has wandered Nature's latest birth,
The crown and glory of her work on earth.
Primeval men are now upon the scene,—
Short, thick-boned hairy beings of savage mien,
With ape-like skulls : but yet endowed with pride
And power of mind to lower brutes denied.
Earth lorded in the past by one-celled mites,
By sponges, urchins, worms, and trilobites,
By fishes and amphibians, reptile, beast,
As higher life from lower was released,
Knows other rulers now.

EARLY PALÆOLITHIC MEN

To face p. 190

And whence and why
Have these new lords Europa come to spy?
Have they as fugitives been driven here
By better men that hold a scene more fair?—
Some Eden scene in Asia's lap afar,
Or in the heart of sunny Africa?
Or have they turned their backs on homes and haunts,
Where savage beasts had gained predominance?
(For though in mind they tower above the brute,
Their lordship is not held without dispute).
Or, have they here as hunters found their way,
Drawn to new lands, now haunted by their prey?
But be what may their far off quitted home;
And be what may, the cause they here have come;
And though on other scenes men may be dwelling,
In strength and skill these lowly types excelling,
Still they are men; and on Europa's scene
No life so high as this, till now, has been.
Men too they are whose skill has borne its fruits
In adding to the gifts they share with brutes;—
In finding further means that will avail
For daily life, than tooth and limb and nail.
Tools do they clutch, and weapons for the chase,
Rough wrought, unground, as we might well nigh trace
The work to Fate. (But not from Fate alone
Have come to them these implements of stone.

For signs indeed of workmanship they bear,
Where mind and skill of hand have had a share.)
They too have learned, by fickle climate tried,
From captured prey to tear the hairy hide,
And make the covering theirs. And far afield,
Where ill would Nature's garb have proved a shield,
On cold and foggy wastes, north far away,
Warm clad they hunt, and trap abundant prey.
Come then are men upon Europa's scene,
To see what here they may from Fortune win.
No paradise indeed will meet the eye,
No Eden land, no lap of luxury.
Fierce beasts abound, alert on every hand :
Rugged and worn and half-clothed lies the land :
And oft may they be forced to make the trees,
And gloomy caves, their homes and refuges.
Yet men they are, whose struggling race has climbed
As from the depths, to stand at last sublimed.
Old brutal thoughts their minds must still beset,
For with the brutes near ties they hold as yet.
And is Man's mind from such thoughts free to-day ?
Within ourselves still thread these not their way ?
For what man lives, whose fate is not to find
Thoughts low and savage lurking in his mind,
Prompters of lust and avarice and hate ?
And point not these to some past brutal state,

AN INTERGLACIAL EPOCH

When through the world creation pushed its way,
With might as right, as with the brutes to-day?
Fair grows the scene throughout Europa's land,
As softer airs increasing breadths command.
Sedge, shrub, and tree thick crowd her soil again,
Where clouds, for snow, now fall in ample rain.
Old mountain outlines clear cut stand once more;
Rills, streams, and rivers wander as of yore.
Though some indeed, that had awoke to find
Old channels blocked, have elsewhere had to wind.
Rapacious beasts in full force roam again,
Prolific herds graze over hill and plain.
And here has Man from far lands found his way;
Unfurled his flag, and brought his power in play.

Yet though the scene with life and colour glow,
And buoyant hope, 'tis but a passing show.
Signs slowly come that these wide fields so fair
Will have once more a monstrous ice to bear.
Keen herald winds are sweeping hill and plain.
The north is up; the white flag waves again.
Persistent grow the skies, with snow and sleet;
And life falls back, an army in retreat.

EPOCH OF GREAT RE-GLACIATION

Again thick lies the ice and gathered snow ;
Green vales are hid, and rivers cease to flow.
High hills are passing slowly out of sight,
As o'er their brows great glacier streams unite.
Life, such as could, has far fled in alarm,
And left the scene behind a deathlike calm.
Scotia and Erin now from side to side
Are clad in ice ; and glaciers coastward glide,
Breaking in bergs, along the western tide.
North lands in Albion once again are sleeping
Entombed in snow. And glacier streams are creeping
To join the North sea waters, now froze o'er
In sheet compact to Scandinavia's shore.
Concealed in ice does Scandinavia lie ;
And on to east, o'er scenes of Muscovy,
The sheet is spread. But there not as of old
Obtains the ice so firm or far a hold.
Nor is Germania, though in part spread o'er,
So much encumbered as she was of yore.
And from such ice as came in times gone by
The Netherlands enjoy immunity.

THE MAMMOTH

To face p. 195

And not in Albion is the sheet extending ;
But in Helvetia mountain snows are sending
Big conjoined glacier columns, far and wide,
And vales and plains are all re-occupied.
Thus though about Europa ice has gained
Great hold once more ; yet has it not attained
To empire such as that that once was there,
Nor is it destined now such sway to bear.

But life from many a scene has been expelled—
A varied life, that in its number held
Primeval man. And of retreat denied
Much, caught as in a trap, has helpless died.
Still much has fled, and thrives secure afar
On lands of Asia now, and Africa.
Yet land there is about Europa's scene
Away to south, where, though the frosts be keen,
Can well clad hardy life, to cold inured,
Of ample means of living be assured.
Musk-oxen, bears, and reindeer now can find
Congenial clime, in places long resigned
By life less hale ; and moss and other plants
Here thrive again, as on old northern haunts.
Here too the mammoth, in his hairy hide,
If cold should prove no greater can abide.
So here rhinoceroses, " woolly " dressed,
May for a time their further flight arrest.

And Man indeed will not forsake a land,
Where prey—his food and clothing—is at hand.

On Asia's northern grounds is ice extending
In glacier streams from Ural heights descending.
Rhinoceros and mammoth, here hemmed in
By ice and snow, in death must quit the scene.
More wise were those that left these haunts in time,
And fled to south and west to genial clime ;
Forsaking scenes long held, though here and there
Food might be gleaned from withering pine and fir.

With little respite Canada's domain,
And north Columbia under ice have lain
E'er since the ice-plague came ; and still the sheet
All stubborn lies, with small sign of retreat.

Thus rules the ice ; thus has the arctic zone
Spread out once more ; and as a conqueror gone,
Despoiling scenes from vale to mountain height,
And ending life, or putting it to flight.
But ample is the space about the world,
Although the north by snow and ice be held,
For life to thrive. And landscapes south away
With wood and sward and flower and fruit are gay ;
Where life in many forms may joyous be,
And Man may glory in his destiny.

EPOCH OF GREAT RE-GLACIATION

And time will come, when, as encroaching seas
Forced slowly back to ancient boundaries,
The ice will yield, and back to old lines draw,
Leaving the trespassed landscapes clear once more.

FINAL RETREAT OF THE ICE

The monstrous ice, before increasing heat,
Is beating now a slow but sure retreat.
But as a tide, retiring from the shore,
Oft rolls in waves, outstripping some before ;
So does the sheet, although its range be less,
On bordering scenes, at times, in fulness press.
But though in winter it may far extend,
Yet is its ancient empire at an end.
Some promise now Europa's landscapes hold
To win again the softer looks of old.
But though less arctic may her lands appear,
E'en in the south oft is the cold severe.
On Francia's southlands reindeer wander wide,
Through scenes with northern mosses still supplied.
Rhinoceroses of the " woolly " kind,
And mammoths here congenial quarters find.
Here too are living brown and grizzly bears,
Musk-sheep, and chamois, wolves, and mountain hares ;
Big " Irish " deer, and red deer too are roaming,
And horses in their troops are hither coming.

Oft too is seen on plain and mountain slope
The bison, ox, and saiga antelope.
Here too are gaunt hyænas come to scour,
And lions to seek what life they may devour.
Thus though the lands at times may gleam with ice,
Well may they prove a hunter's paradise.
No wonder to a scene, thus filled with prey,
Will man, a hunter born, soon find his way.
And real profession to his struggling race,
Not sport or pastime, is the eager chase.
And now are coming men upon the scene,
Whose haunts, perchance, in Afric once had been.
(For still with Afric is Hispania one,
And e'en Italia's lands with Afric join ;
And held in prison, piecemeal, is the Sea
That oft afar had strayed at liberty.)
And who are these new hunters now arriving
On Francia's southern lands, to seek their living ?
Are they but such as those that had explored
Europa's lands, when for a time had thawed
The long continuous ice ; and who from flints
Had forged, though rudely, tools and implements ?
Not such they seem,—but men of fuller mind,
Of more resource, more gifted, and refined.
Still rude indeed their implements appear,
Fashioned from bones, and stones and horns of deer ;

And still to them the art seems quite unknown
Of how to grind to edge their rough flaked stone.
But though all rude their implements may be,
More skill these show, and more variety
Than did the ones the first men could command,
When foot they set upon the ice-freed land.
Not merely clumsy lumps of battered stone
Do these new comers to Europa own ;
But well shaped saws, skin-scrapers, tools to bore,
And lance and arrow heads are in their store.
Bone needles too they have, with well-drilled eye :
And these the womankind may have to ply,
The while the men go hunting far abroad ;
And will not reindeer sinews thread afford,
Wherewith the housewives may together string
The scraped out skins, for clothes and sheltering?
But not in better implements alone,
Have these new men their greater powers shown.
Of fire the various uses are they learning,
And by their huts and caves hearths bright are burning ;
And well cooked flesh on home return they find,
And warm they keep though bitter blow the wind.
Reindeer and bison yield them welcome food ;
Nor will musk-sheep and antelope elude
Their hungry search. Guessing but little yet
To what good service horses may be set,
They but regard them fish caught in the net,

CAVE MEN (HUNTER-ARTISTS)

To face p. 200

And cook and eat them. Indeed the idea to tame
And make wild life domestic seems to them
Not yet in dawn.
But not within the chase
Does life four-footed only find a place.
These men are fowlers too ; and in deft snares
Are capercaillie taken unawares ;
Where too grey partridge, willow grouse, and crane,
Wild duck, white owl, and ptarmigan remain.
Nor does the finny race escape their eye,
And oft their feasts are well enriched thereby.
Trout, salmon, pike, and carp, chub, dace, and bream
Are safely brought to land from lake and stream,
And hurried home, where wife and hungry bairns
May oft wait anxious till their lord returns.
No thought seems theirs to cultivate the land,
And taking, snatching all from Nature's hand,
No seeds they sow ; and herb and shrub are found
In state as wild as is brute life around.
No pottery is theirs ; nor does the art
Of spinning find, in their rude life, a part.
Yes, savages they are,—long leagues away
From levels reached by cultured life to-day.
Yet in their minds is running thought more high
Than merely thought to feed and multiply.

Another world is breaking on their sight,
Than that whose all is carnal appetite.
More real than dreams is Art with these men here.
The mammoth, bison, horse, and antlered deer
Must frequent hold their thoughts; but not their prey
Alone with hunter's eye do they survey.
For time they have, and power is theirs to trace,
In graphic strokes, the victims of the chase.
See here a man on tusk of mammoth graving,
With pointed flake, an angered monster waving
Its trunky snout. Another, that has seen
The reindeer bucks in antlered contest keen,
Depicts to life the well-remembered scene.
Here one on stone, with more laborious pains,
Draws "Irish" deer, and red-deer on the plains.
With faithful hand the horse is outlined too,
And even man, at times, is brought in view.
Thus have the hunter-artists found pursuit,
That lifts them high indeed above the brute,
And shows the loftier levels they have gained
Than those their rude forerunners had attained.
And well in shape of head these men compare
With those first men that breathed Europa's air.
Massive may be their jaws and forward set,
Giving the face an ape-like cast, but yet

High skulls are theirs, and of a different mould
From such ape skulls, as had the men of old.
What, then, of those first hunters that had found
Europa's scene a happy hunting ground,
When for a time the ice had been undone,
And buried lands again had felt the sun?
Live here some scions of their lowly race,
To follow in Europa still the chase?
Not so it seems; no trace of them is here,
Whatever fortune may be theirs elsewhere.
Perchance the monstrous ice their knell had tolled,
And savage beasts as merciless as the cold.
Though some indeed, when ice again outspread,
To other lands in safety may have fled.
And even here some few may hunt about,
And on some chilly northlands still eke out
Precarious lives. But if such still there be,
Not theirs it is to lead humanity.
Time rolls along. The sun is shining forth
On verdant scenes, long ice-bound in the north.
Shrunk has the sheet to lines far north away,
And clime around grows more as that to-day.
Willow and birch for long by ice-fields kept
From Scandinavia's scene have thither crept
To thrive again. There too are aspens, pines,
Hazels and oaks, with far pushed frontier lines.

And on comes life, as on the heels of night
Presses the dawn with slowly spreading light.
And scenes forlorn and wasted far and wide
Begin to glow in all their former pride.
The hunter artists now more northward raid,
Where hardy prey to pastures new has strayed.
Some now on Belgia's land have come to roam,
Nor do they, in their new adopted home,
Forget their art. Others still wider stray,
Where not the North Sea yet has cut its way ;
And to Britannia's land pursue their prey.
Across Germania some their range extend,
And here their wanderings eastward seem to end.
Thus has the land, from monstrous ice released,
Regained long banished life : and man, and beast,
And bird, and tree, and shrub, through hill and plain,
Proclaim Europa once herself again.

Columbia's upheaved tracts, where snowfields lay,
Are sunk to levels now of earlier day.
And all her northern lands long buried quite,
With ice on ice, are coming now in sight.
Once more the hills are opening to the sun ;
And on old ways, long locked up rivers run.
See here Niagara, held in ice of yore,
And blocked with glacier débris, speeds once more ;

And swoll'n by melting floods of ice and snow,
From upland scenes, terrific is her flow.
The Mississippi, with re-doubled force,
From melted flood, rolls on a widening course.
And countless streams and rills that frozen lay
From east to west are making holiday.
More warm and steady here is climate growing,
And banished life comes on as sea o'erflowing
Old barrier shores. Re-clothed are lands in green
As plant and shrub and tree invade the scene.
Forests again are spreading far and wide,
And steppe-like wastes are slow revivified.
Right to the skirts of ice press hardy plants,
And animals, inured to cold, advance
From scenes become too mild; and in their place
The life more south is pressing on apace.
Columbia, famous in the days of old
For champion reptile life, comes now to hold
Huge statured beasts. Indeed such giant bears,
Lions and horses, as those that now are hers,
(Surpassing all such forms to-day in size),
Have up till now not elsewhere met our eyes.
Truly the land is good, or whilst the ice
Held fast these scenes, these beasts had found some paradise.
Gigantic sloths have come to look around,
Though none are here of such proportions found

As those huge brutes to south. Elephants have taken
Hither their way. Mastodons, though forsaken
Seem all their "old world" haunts, here find a living;
And tapirs, elks, and oxen are arriving.
Travelling, maybe, o'er lands where not as yet
Had Arctic waters and Pacific met,
Men here have come, that seem of race the same
As those first men that to Europa came.
At least their tools and weapons, rude wrought, shew
That they as yet no higher culture know.
(And men indeed in culture such as these
Had scattered wide through Asia's territories.
And men in state the same for long had been
In Afric too, at least on Egypt's scene.)

Whilst thus Columbia, of thick ice relieved,
And fair Europa have their place retrieved;
So too are other lands, long overlain,
Freed of their yoke, and bright with life again.
And thus the plague, at length, has passed away;
And though shrunk glaciers still afar may stray,
Yet such an ice, that had been as the deep
Frozen on land, from henceforth now must keep
To polar zones: and there, in closer walls
May hold, and oft, its monster festivals.

MODERN PERIOD

THOUGH, in their thousands, years as yet will be
Ere man himself will keep his history,
Our earth is here before us nigh progressed
To look and life, by her to-day possessed.
Vast is the change indeed since when the haze
Whirled round in space, a wild, disordered maze;
Ere sun and moon and planets, all in one
Vague mist confused, to shape had yet begun.
What man, if such had been, and given a place
To view the misty chaos, poised in space,
Could have surmised that in the glowing mass
Such wondrous change in time would come to pass:
That whirling particles would together cleave,
As knots and cores, and thus would slowly leave
The parent mist, and separate orbits run
Around the grandest core—the forming sun.
That from the Earth, a knot would take its flight
Her moon to be, and constant satellite.
That by degrees our slowly cooling globe,
Contracted more, would lose her molten robe;

And to her form, more shapely, Time would bring
For gas and liquid, solid covering.
That aqueous vapours, hovering long around,
Would then descend, and flood the thickening ground.
That sea and land would thus her surface hold,
By uplifts and subsidences controlled.
That on the unstable scene would life arise,
Formed and reformed to meet emergencies.
And that the globe in time would come to be
A world of life, alike through land and sea :—
What man indeed, mist gazing, could have guessed
The floating haze such wealth unformed possessed.
Indeed the unfolding passes as a dream ;
And things must often be what not they seem.
Although, perchance, far, far back in the past,
In outline rude the continents were cast
Much as to-day ; still have the land and sea
Disputed portions held alternately.
Lands once beneath the brine have upheaved been,
Lands once in view have joined the briny scene.
But now with glacial epochs left behind,
The land and sea for most part are confined
As seen to-day. (Not but exchange, though small,
Goes ever on along the littoral.)
Nor are there any forms of life to-day
But what these scenes before us now display.

Mere specks of life abound through land and sea,
The Protozoa called, and these may be
But little changed from their first ancestry.
In varying depths Sponges here live and thrive,—
Some simply formed of cup shape primitive ;
Others whose finely wrought and complex frames,
And dainty looks have won for them the names,
" Flower Basket of Venus," and " Mermaids' Gloves."
Along the coasts in bays and silent coves,
Live divers coloured, and of varying size,
" The roses of the sea," anemones.
Cup-shaped, and disc like jelly-fish abound,
Stinging and seizing varied prey around.
As " Venus Girdles," other kinds are known,
Side lengthened forms to shape of ribbon grown.
Corals, seen far far back, in Cambrian brine,
Keep up in various forms their ancient line.
Some still there are that solitary abide,
And cast their buds, far carried by the tide.
Whilst social kinds, in persevering hosts,
Small isles embrace, and reef off tropic coasts,
As in the past. Creatures of " hedgehog " skin,
Echinoderms called, (and in Sea-urchin seen,
And Star-fish, and " Sea-lily " long of old),
In various forms still keep on life their hold.

The wriggling, long established world of Worms
Is here alive with many divers forms;
Twisting and twirling as their task were set
The signs to trace of every alphabet.
Earth-worms, Sea-worms, leeches and "tubes" abound,
Worms "arrow" called and "tape," worms "flat" and "round,"
Worms "whirl" and "thread," and worms as scissors bound.
No less in wealth the "crusted" world appears,
As flower and fruit of untold bygone years.
Shrimps, lobsters and the like in shallow seas
In various tribes abound, and families.
Waterfleas, foiling the ravages of Time,
Still thrive in muddy haunts in many a clime,
Seeming indeed eternal as the slime.
Out of the depths of Ages as it were,
In shells of various shapes and hues, appear
Molluskan groups in regions far and near:
Spreading through land and sea, and far from light
To ocean beds, where reigns perpetual night.
Winkles and welks and other snails allied,
Of long descent, wide scenes have occupied.
In estuary, and bay, along the coasts,
And out to sea innumerous bivalved hosts
Live as of old;—oyster and mussel groups,
Arcs, scallops and the like as serried troops.

And forms there are in warm and shallow sea—
Tellens, Tridacna's, and Veneridæ—
Aglow with colour gay. See them around
With yellows, pinks, and purples hued and bound,
Blues, greens and reds, as might lie rainbows drowned.
" Lampshells," that in Silurian years their prime
Attained, and then in whirligigs of Time
Oft suffered much, have weathered all their storms,
And some still live unchanged from Cambrian forms.
Though Belemnites, from mighty rise and fall,
Have gone long since, some forms collateral—
Squids and the like—the vanished hosts recall.
Nautili, that back to times Silurian date,
Survive, in spite of buffetings of Fate,
As though with rare elixir animate.

The fish and fish-like life, whose orders new
Burst as an apparition on our view
In Eocene times, has now within its pale
An endless stock, from tiny sprat to whale.

And what of insects, present everywhere,
Through sea and land, and flitting in the air?
Why half the matter charged with life on land,
These little creatures, countless, must command.
See how in orders, legions filled, they rise,
Living alone, and in communities ;

From mites so small as scarce to meet the eye,
To ant, and bee, and gorgeous butterfly.
Amphibian life,—that in past times, and long
Was at the head of all Creation's throng,
And then by Reptile creatures was outdone,
And sunk still more before the rising sun
Of Mammal life,—in holes, and ponds, and bogs,
Still has its salamanders, toads, and frogs.
The once great class, now long since overturned,
That for the "Mid-life" times the name has earned
Of "Reptile Age," in varied forms lives on,
Though from its ranks its mighty ones are gone;—
Its Theromorpha, Dinosaurs, and Plesiosaurs,
And champions other of the Reptile "cause."
But crocodiles and turtles still remain,
Though they indeed, 'twould seem, are on the wane;
Lizards and snakes seeming to promise best
To keep alive this ancient class depressed.
Though birds in earlier times there must have been,
(Of whose frail forms no trace has yet been seen),
'Twas Jura times that first to us proclaimed,
In that strange form, the Archæopteryx named,
Their rise on earth. Others in after times
Diving, climbing, flying, were seen in many climes.
In gay and sombre plumage far and wide
Are now the voiceful hosts in all their pride;

From Humming-birds, as small as Bumble-bees,
To Eagles, Vultures, Storks, and Ostriches.
And on some scenes huge Moa birds are thriving,
(Though be they not in this our day surviving) ;
See here Dinornis, on his lonely plains,
Twelve feet in height the feathered giant attains.
Good wings, perchance his race of old could boast,
But from disuse these now are well nigh lost.
And doomed are Moas to complete their span,
As other life, when face to face with Man.

Wide different now the Mammal life is seen
From what it had in early life times been ;
When Horse and Tapir ; Civet, Dog, and Bear ;
And various other beasts commingled were.
By change of clime, and fitter life suppressed,
Its pristine types have well nigh gone to rest.
Across Time's stream, the ford stones, as it were,
That led to Mammal life now scarce appear ;
And egg-laying Duck-bills, and Spined Ant-eaters alone
Remain of many a long gone stepping-stone.
Marsupial life that further carried on
The upward move by Monotremes begun,
(Bringing in tiniest forms its offspring forth,
To be in " pouch " brought on to larger growth),
Now finds its range once wide and free drawn in,
And all its giants vanished from the scene.

Placental beasts so called (whose young are cast
In states far more advanced) hold regions vast.
Forms, by vague stocks foretold, now stand out clear,
And "general" beasts have had to disappear.
But though distinct, in numbers grow they less,
And smaller grows the range to which they press.
Gone, gone for ever is their golden age;
And poor indeed appears their heritage.
Changes of clime, uncertain food supplies,
And last, not least, Man's wide activities
Have sunk their pride. And those that have no worth,
In his regard, precarious live on earth.

Fierce struggles must have been in times gone by
'Twixt Man and beast to gain ascendency;
And for a time on many a savage scene
Man's fate may well in jeopardy have been.
But now his throne is set, and by his wit,
Not by brute force, has he accomplished it.
And over all he stands, a victor wreathed,
And pride of all the life that ere has breathed.

New men are now Europa's scene commanding,
And men they are that seem of higher standing
Than were the hunter-artists. Though fine art
In their pursuits appears to play no part.
But though their talents not to Art are turned,
Yet have they useful occupations learned.

A Neolithic Farmstead

To face p. 211

Wild life to them is not a life that may
In rivalry with man pursue its way ;
Nor merely life, hunted to be and slain,
That save in death can yield no use or gain :
But life that into service must be pressed,
And made to bend its will to man's behest.
Grand is the secret here by Man obtained,
Walls has he scaled, and fateful entry gained
To fruitful fields. And with his clue secured,
His rapid progress is indeed assured.
In truth it seems as it were Nature's will
To let him share her rule, for good or ill.

As mounts the mind to higher life and thought,
External change in man is slowly wrought.
And these new men, with grand ambitions proud,
Unlike the men of old, ape jawed and browed,
Fine featured are. And though the fight, the chase,
And orgy feast will still retain a place,
Grazing and farming form their main career :
And what advance in life does this declare.
Reclaimed from savage life, in hurdled cotes,
Far from their native wilds, are herds of goats.
Boars too there are, that now are kept controlled,
In life wide changed from that of sires of old.
From old wild oxen herds have creatures been
Domestic made. And on the farmstead scene,

Some horses now are brought to labour stern,
Though oft "against the traces" they may turn.
Deer too about the prosperous farms we see,
Grazing the land, in meek captivity.
From yelling brutes to wolf and fox allied,—
Whose howls indeed still wake the woodlands wide—
Trained is the dog to hunt and to defend,
And long will he live on, Man's faithful friend.
Dominion great indeed will man assume
O'er things of earth, in times far off to come.
And life from time to time will transformed be
By his invention and discovery :
Yet in the meed of praise that we bestow
On those that make the course of life to flow
On grander lines, let place and share be found
For those that subject made wild life around ;
And struck the line and pathway, as it were,
That brought to man in Nature's rule a share.
Not brutes alone have these men now in hand,
For wild plant-life alike do they command.
Seeds have they sown of grasses from the sward,
And wheat and barley crops their pains reward.
And mealing stones, well wrought, they too possess,
Wherewith to flour their grainy stores to press.
Metal as yet to them seems quite unknown ;
But in their tools and weapons, wrought of stone,

More skill and finished workmanship appear,
Than was of old on such work brought to bear.
The art of grinding has discovered been,
And implements are ground to edges keen ;
And as some growing sense of taste to please,
Polished are oft the smoothed down surfaces.
Some knowledge too of pottery is theirs,
Though rough and rude as yet may be their wares.
Acquaintance too with spinning is possessed,
As burnt clay whorls about their homes attest.
A farming life must needs bring in its train
A greater union in the ranks of men,
Than hunter life can bring. And hence we see
These husbandmen in close community.
And families close-tribed must surely gain
A strength unknown to widely scattered men.
Where, then, are now the hunter-artists found?
Have they, through changing times, maintained their ground?
Or are they from this mortal scene all gone,
Their part in life performed, their labours done?
No sign of them, indeed, we here can trace ;
Perchance they driven were from place to place
By these new farming tribes, and in the end
Were clean wiped out, or forced far north to wend.
As roving hunters scarce could they have learned
To what advantage union may be turned ;

What work by men together can be done ;
What risks be faced, what victories be won ;
And well might fail, when brought in touch at length
With men that had in union gathered strength.
Yet rugged scenes, far far to north away,
May some have reached, and where they safe can stay.
And Eskimos, perchance, their line may trace
To such lone exiles, forced from place to place.

To south the North Sea waters now have pressed,
And met the Atlantic pushing from the west :
And Britain, joined for long, by isthmus lands,
With Francia's scenes, now wholly severed stands.
Men from these farming tribes across the sound,
By raft, canoe, and coracle, have found
The white-cliffed isle. And here indeed there lies
An open field for strenuous enterprise.
And brother tribesmen o'er "the silver streak,"
Will come ere long their fortunes here to seek.
Silurian tribes, perchance, of times to be
In these invaders had their ancestry :—
The tribes by Celts slow forced to Britain's west,
And by Imperial Rome at last suppressed.
Ah ! chosen land, girt by a guardian sea,
Small though thou art, grand will thy history be.

Upon thy scenes will rise a people proud,
Welded to strength, and rich with gifts endowed :—
Gifts not alone to them to be confined,
But by them freely used to raise mankind :
And from thy shores to lands far o'er the sea
Will spread their empire, light, and liberty.

All, all is change, not e'en the studded sky
Has held its jewels from all eternity.
And these, not formed for ever from the past,
Will cease, in time, their lustrous lights to cast :
And other orbs, as bright, will fill their place,
And with new light illumine endless space.
So must our earth, part of a common fate,
Sink in its turn, cold and inanimate ;
And to its sun, burnt out, once joined again
Be borne through space, and at Fate's call remain.
And must the spirit of the life here spent
Sink with the scene of its development?
Is all the work around, by Nature wrought,
A passing show, destined to end in naught?
But here to things unknown we vainly press,
And man, bowed down, feels all his littleness.
Yet seeing mystery is in things that be,
He ploughs his way in hope, and reverently.

And though old myths and legends must decay,
And like old forms of life slow pass away ;
Hope still will stand, unnumbered with the dead,
To breathe of worlds, whence pain and death have fled,
Where peace prevails, and Life is perfected.

FINIS

NOTES

LIST OF PRINCIPAL BOOKS CONSULTED

INDEX

NOTES

PRE-PALÆOZOIC AGES

PAGE	LINE	
7	138	There is no geological evidence of a satisfactory nature that life existed in these Ages. That life did then exist may, however, be reasonably inferred from the comparatively advanced forms in which it appears in the Cambrian period.
8	177	This is known as the *morula*, or mulberry-like stage.
9	183	This is known as the blatosphere, or bud-like stage.
9	189	This is known as the *gastrula*, or belly-forming stage.
10	215	This is known as the trocosphere, or wheel stage. Worms are developed from three layers of cells.

PALÆOZOIC AGE

CAMBRIAN PERIOD

11	10	The Mediterranean Sea is but a remnant of a vast oceanic area. Bonney, "The Story of Our Planet" p. 464.
11	15	It was probably from a continent to the west, and which may have included Ireland, that the sediment was carried, which formed on the site of Wales what are known as the Cambrian beds. Bonney, p. 396
12	26	The sea at this time probably covered seven-eighths of the globe. At the present time it covers rather less than three-fourths.

NOTES

PAGE	LINE	
12	30	The sea no doubt at this time possessed its seaweeds ; and *Oldhamia* may be referred to them. The geological evidence, however, of seaweeds is not clear until we reach the Silurian period. Geikie " Text Book of Geology " vol. ii. 910 ; Dana " Manual of Geology " 469 ; Nicholson and Lydekker " Manual of Palæontology " vol. ii. 1482.
12	31	*Protospongia.*
12	33	*Medusina,* and others.
12	35	Corals (*Archæocyathus* and others). Graptolites (*Bryograptus*).
12	37	*Protocystites.*
12	39	Trails and borings of sea-worms are found in the earliest Cambrian strata.
12	42	Brachiopods.
12	44	Llamellibranchs (*Modioloides priscus*). Gastropods (*Platyceras primævum*).
12	46	Pterapods (*Hyolithes*).
13	50	*Phyllocarida* (*Hymenocaris vermicauda*).
13	53	Ostracoids (*Leperditia*).
13	63	*Olenus truncatus, Conocoryphe Sultzeri, Olenellus Kjerulfi,* and many others.
13	67	Crinoids (*Dendocrinus Cambriensis*).
13	69	*Palæaster.*
13	72	*Orthoceras* and *Cyrtoceras.*
14	75	*Foraminifera.*
14	92	*See* Nicholson and Lydekker, p. 99

SILURIAN PERIOD

15	11	*Necrogammarus Salweyi.*
15	18	Corals with structural arrangement presenting a wrinkled (*rugosus*) appearance are termed " rugose." " Tabulate " corals possess highly developed transverse partitions or *tabulæ.*

NOTES

PAGE	LINE	
16	23	Palechinoids.
16	26	Ophiuroids.
16	30	*Turrilepas Canadensis.*
16	31	*Avicula.*
16	32	Horse mussel (*modiolopsis*), Cockle (*cnocardium*), Scallop (*aviculopecten*).
16	33	*Neolimulus, Hemaspis.*
16	35	*Lituites.*
16	45	Eurypterids (*pterygotus*).
17	67	*Pteraspis, Cephalaspis,* and others.
17	71	*Holoptychius* from Lower Silurian sandstone, Colorado.
17	72	*Polypterus birchir,* an inhabitant of the Nile.
17	74	*Thelodus, Onchus.*
21	170	*Sphenophyllum.*
21	172	Lycopods.
21	174	*Protannularia.*
22	179	*Protocimex Silurica* from the lower Silurian, southern Sweden. It is the earliest known fossil insect.
22	182	*Palæoblattina.*
22	184	*Palæophonus nuncius.*

DEVONIAN PERIOD

23	7	*Bothriolepis, Coccosteus, Pterichthys.*
23	8	*Homosteus.*
23	11	*Mesacanthus, Chiracanthus, Glyptolæmus, Gyracanthus.*
23	12	*Onychodus sigmoides.*
23	16	*Chirolepis.*
23	17	Dipnoi (*dipterus, phaneropleuron*).
24	26	Amphibians probably sprang from the Dipnoi.
25	64	*Spirifera mucronata.*
25	68	*Gyroceras.*
26	77	*Pterygotus Anglicus.*
26	78	*Cupressocrinidæ.*

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PAGE	LINE	
26	79	*Helianthaster* and others.
26	80	*Calceola sandalina, Pleurodictyum problematicum.*
26	81	*Phillipsastræa.*
26	82	*Palæopalæmon.*
26	87	*Spirophyton, Cœlotrochium.*
26	90	This plant may be a connecting link between the Rhizocarp and the Club-mosses. Dawson, "Geological History of Plants," p. 64.
26	92	*Lepidodendra.*
27	99	*Equisetaceæ.*
27	103	*Psaronius, Caulopteris Lockwoodi.*
27	114	*Dadoxylon, Ormoxylon, Cordaites.*
27	121	Pines and their allies are the lowest form of the Phanerogams (flowering plants), and a connecting link with the Cryptogams (flowerless plants).
28	128	*Platephemera.*
28	130	*Lithentomum, homothetus.*
28	131	*Xenoneura.*
28	132	Dawson cited by Nicholson, "Ancient Life History of the Earth," p. 145
28	134	*Kampecaris, Archidesmus.*

CARBONIFEROUS PERIOD

30	4	Jukes-Browne, "The Building of the British Isles," p. 109.
30	11	*ib.*, p. 123.
30	14	Dana, "Manual of Geology," p. 633.
30	16	It has been estimated that a cubic inch of chalk contains more than a million microscopic organisms, chiefly shells of rhizopods. Dana, p. 860.
30	20	The mountain Limestone forms the general base of the Carboniferous strata, and is generally succeeded by beds known as the Millstone Grit.

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PAGE	LINE	
32	48	*Productæ.*
33	75	*Xiphosura.*
33	81	*Anthrapalæmon, Crangopsis, Pygocephalus.*
33	83	*Orodus, Cochiolodus,*
33	85	*Psammodus, Petalodus.*
35	138	*Pupa vetusta, Pupa vermilionensis, Zonites priscus.*
35	142	*Palæodictyoptera* (precursors of modern beetles). Scorpions (*Eoscorpius carbonarius, Cyclophthalmus senior*).
35	143	*Protolycosa anthracophila, Phalangiuea brassifolia.*
35	144	*Titanophasma, Protophasma.*
35	145	*Archimylacris.*
37	191	*Keraterpeton, K. crassum, Baphetes planiceps, Loxomma, Archegosaurus.*
37	194	*Hylonomus.*
37	195	*Dolichosoma longissimum.*

PERMIAN PERIOD

39	19	*Walchia, Ullmania, Voltzia, Ginkophyllum.*
40	22	*Pterophyllum Psygophyllum.*
40	39	*Euechinoids.*
40	43	*Amblypterus, Platysomus, Rhabdolepis, Palæoniscus macroponus, Acanthodes.*
41	48	The technical names for the primitive are diphycercal (where the backbone runs straight down a tapering tail), and heterocercal (where the tail consists of two lobes and the backbone bends slightly up to take the line of the upper lobe).
41	53	*Archegosaurus, Actinodon, Protriton, Melanerpeton.*
41	56	*Proreptilia* (*Eryops, Cricotus*).
41	59	*Palæohatteria longicaudata, Proterosaurus.*
41	67	*Naosaurus claviger.*

NOTES

MESOZOIC AGE

TRIASSIC PERIOD

PAGE	LINE	
44	19	Jukes-Browne, "The Building of the British Isles," p. 187.
44	24	Jukes-Browne, "The Buildng of the British Isles," p. 188.
44	35	Bonney, "The Story of Our Planet," p. 409.
44	38	Dana, "Manual of Geology," p. 737.
44	39	*Dicynodontia.*
44	43	Dana, p. 739.
45	65	*Equisetum, Schizoneura.*
45	69	*Sphenopteris, etc.,*
45	70	*Anomopteris.*
46	82	*Encrinus gracilis*, and *E. liliiformis.*
46	85	*Aspidura.*
46	86	*Montlivaltia.*
46	87	*Penæus, Æger*, etc.
46	89	*Cythere.*
47	97	*Avicula contorta : Cardium : Pecten.*
47	99	*Turritella, Cerithium*, etc.
47	100	*Orthoceras.*
47	104	*Aulacoceras, Atractites.*
47	118	*Hybodus, Acrodus.*
48	123	*Pholidophorus.*
48	124	*Saurichthys, Belonorhynchus.*
48	129	*Ceratodus.*
48	142	*Trematosaurus, Mastodonsaurus (Labyrinthodonts).*
50	181	*Microsauri, Petrobates.*
50	182	*Telerpeton elginense, Rhynchosaurus, Hyperodapedon.*
50	185	*Palæohatteria longicaudata, Protosaurus.*
51	210	*Theriodontia (Lycosaurus, Cynodraco).*
51	215	*Placodus*
51	217	*Elginia*
51	219	*Dicynodon.*
51	222	*Elginia mirabilis.*

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PAGE	LINE	
52	224	*Oudenodon.* This, however, may have been the female of Dicynodon. Gadow, "Amphibia and Reptiles" (Cambridge Natural History), p. 310.
52	235	*Psephoderma, Proganochelys.*
52	248	*Anchisaurus, Zanclodon, Megalosaurus, etc.,*
53	263	*Aëtosaurus.*
53	264	*Belodon.*
53	266	*Stagonolepis.*
54	289	*Mesosaurus, Nothosaurus.*
54	292	*Lauriosaurus.*
54	295	*Mixosaurus.*
55	323	*Microlestes.*
56	331	*Dromatherium, Micronodon.*
56	337	*Myrmecobius fasciatus.*

JURASSIC PERIOD

60	23	*Palæoscyllum.* *See* Günther, p. 198.
60	24	*Anthropterus.*
60	26	*Chondrosteus.*
60	28	*Caturus.*
60	30	To Bow-fins, *Megalurus* and others; to Sprats and Herrings, *Leptolepis.*
60	31	*Isopholis, Ophiopsis*
60	34	*Aspidorhynchus, Belonstomus*
60	45	*Leptolepis sprattiformis.*
61	55	*Ditremaria, Narica,* etc.
61	57	*Ostrea edulis, Gryphæa, Exogyra, Pernostrea.*
61	61	*Arietites, Ægoceras,* etc.
61	72	*Nautilidæ.*
62	73	*Clavatus, Paxillosus,* etc.
62	84	*Eryon.*
62	85	*Glyphæa, Pseudastacus.*
62	87	*Mechochirus.*

NOTES

PAGE	LINE	
62	89	*Palæinarchus.*
62	98	*I. platyodon.*
63	101	*P. dolichodirus.*
64	105	*Thaumatosaurus, Pliosaurus.*
63	110	*Pleurosternum, Stegochelys,* etc.
64	136	*Cædacarpum, Bambusium.*
64	142	*Acrididæ. Baseopis. Tenebrionidæ.*
64	143	*Termites. Palæomyrmex prodomus.*
64	145	*Gryllacris, Locusta.*
64	146	*Palæontina oolitica.*
64	147	*Gryllus.*
64	148	*Geocorisa. Nepa.*
64	149	*Ephemeridæ. Libellulidæ. Phryganeidæ. Sialidæ. Panorpidæ.*
65	159	*Megalosaurus.*
66	177	*Scelidosaurus.*
66	181	*Teleosaurus, Mystriosaurus, Pelagosaurus.*
66	187	Pterodactyls.
67	214	*Dimorphon macronyx, P. crassirostris, P. spectabilis. Ramphorynchus phyllurus.*
67	226	*Phaseolotherium.*
67	227	*Amphitylus, Amphilestes, Amphitherium.*
68	237	Kayser, "Text Book of Comparative Geology," translated by Lane, p. 238. The restoration of primeval geography must be largely a matter of conjecture. Neumayr ("Erdgeschichte" II. 263) has drawn a map of the world in Jurassic times, in which nearly the whole of the Atlantic Ocean is represented as dry land.
68	252	The geography of Britain during the Jurassic Period is dealt with by Jukes-Browne, in ch. IX. of "The Building of the British Isles."
69	269	*Thecosmilia,* etc.
70	278	*Megalosaurus.*
70	286	*Camptosaurus* (family *Iguanodontidæ*).

NOTES

PAGE	LINE	
73	361	*Ptenodraco.*
73	365	*Pterodactylus antiquus.*
73	367	*Cycnorhamphus.*
73	368	*Scaphognathus.*
73	369	*Rhamphorhynchus Muensteri.*
73	377	*Plagiaulax.*
74	379	*Spalacotherium.*
74	383	*Sphinx Snelleni*, etc.
75	416	*Archæopteryx.*

CRETACEOUS PERIOD

77	19	Jukes-Browne, "The Building of the British Isles," p. 274.
78	27	*Chara.*
78	28	*Unio Vuldensis*, *Vivapara (Paludina)*, *Cyrena media.*
78	29	*Lepidotus Mantelli.*
78	30	*Cypris.*
78	31	*Archæochelys*, *Hylæochelys.*
78	32	*Pholidosaurus*, *Goniopholis.*
78	37	*Hylæosaurus.* *Iguanodon Mantelli.*
78	39	*Megalosaurus*, *Plesiosaurus*, *Pterodactylus.*
80	92	Kayser, p. 282.
81	98	Bonney, "The Story of Our Planet," p. 458.
81	102	Jukes-Browne, p. 286.
82	147	Kayser, p. 320.
83	149	*Caryophyllia.*
83	150	*Metopaster*, *Nymphaster.*
83	151	*Cidaris*, *Acrocidaris*, *Salenia*, etc.
83	155	*Marsupites* (stalkless).
83	159	*Lingulidæ*, *Discinidæ*, *Craniadæ.*
83	170	*Hoplites*, *Acanthoceras.*
83	171	*Crioceras.*
83	172	*Hamites.*
83	173	*Baculites.*

NOTES

PAGE	LINE	
84	175	*Turrilites.*
84	191	*Ficula.*
84	192	*Cassidaria. Solarium. Tritonium. Olivella. Haliotis.*
84	193	*Nassa.*
84	194	*Gryphæa, Exogyra.*
84	197	*Inoceramus.*
85	205	*Dromiopsis, Palæocrystes.*
85	213	*Galeocerdo.*
85	214	*Scyllium.*
85	215	*Ptychodus.*
85	216	*Sclerorhynchus.*
85	217	*Macropoma*, etc.
86	231	*Apodes.*
86	233	*Clupea.*
86	236	*Petalopteryx.*
86	237	*Hoplopteryx.*
86	240	*Cladocyclus.*
86	241	*Pagellus.*
86	242	*Chirothrix.*
86	243	*Pycnosterinx.*
86	245	*Platax.*
86	246	*Pachyrhizodus.*
87	255	*Pythonomorpha (Mososaurus, Liodon* and others).
87	272	*Dolichosaurus, Acteosaurus.*
87	273	*Iguanodon, Megalosaurus, Acanthopolis* and others.
88	287	*Enaliornis.*
88	294	Dana, "Manual of Geology," p. 813.
89	328	*Pachyrhizodus, Empo* and others.
90	338	*Protostega gigas* and others.
90	340	Mosasaurids.
93	426	*Claosaurus.*
94	432	*Lælaps* also called *Dryptosaurus.*
95	460	*Coniophis precedens.*
95	468	*Pteranodon longiceps.*

NOTES

PAGE	LINE	
96	495	*Hesperornis.*
96	496	*Graculavus.*
96	497	*Icthyornis.*
96	500	Dana, p. 814..
96	506	As regards Australia and New Zealand, *see* Wallace, "Island Life," ch. XXI. and XXII.

CAINOZOIC AGE

EOCENE PERIOD

103	88	*Didelphys.*
103	92	*Adiposorex*, *Adiposoriculus.*
103	94	*Vespertilio.*
104	98	*Arctocyon*, *Hydodectes*, *Heteroborus.*
104	100	*Pulæonictis.*
105	129	*Plesiadapis*, *Protoadapis.*
107	193	Boyd Dawkins, "Early Man in Britain," pp. 18 and 25.
108	202	*Tetrapterus priscus.*
108	203	*Palæophis toliapicus.*
108	207	*Odontopteryx.*
108	214	*Halcyornis.*
108	216	*Proherodius.*
108	217	*Dasornis.*
108	219	*Lithornis.*
108	220	*Argillornis.*
109	232	*Protorohippus*, *Equus eohippus.*
109	237	*Eohyus.*
109	238	*Lemuravus*, *Hyopsodus.*
109	243	*Oxyclænus* and others.
110	249	*Psittacotherium*, *Dryptodon.*
110	252	*Pantolambda.*
110	256	*Uintornis.*
110	257	*Sula.*
110	258	*Bubo leptosteus.*

NOTES

PAGE	LINE	
102	259	*Diatryma gigantea.*
112	314	Remains of nearly all these fishes have been found in the Eocene of Monte Bolca, near Verona. The London Clay supplies some specimens.
113	334	*Anoplothers.*
113	337	*Anthracotherium dalmatinum.*
113	340	*Pachynolophus, Anchilophus.*
114	352	*Mæritherium.* *See* C. W. Andrews, "On the Evolution of the Proboscidea."
114	364	*Palæomastodon.*
115	383	*Hyænodon.*
115	385	*Amphicyon.*
115	387	*Cynodictis.*
115	391	*Heterohyus, Microchærus, Cœnopithecus.*
116	411	*Limnofelis.*
116	412	*Mesonyx.*
116	414	*Patriofelis.*
116	418	*Palæosyops.*
116	419	*Helohyus, Homacodon, Elotherium uintense.*
116	420	*Amynodon.*
117	427	*Oromeryx.*
117	428	*Protylopus.*
118	454	*Hyopsodus* and others.
118	470	*Boavus* and others.
119	477	*Zeuglodon.*
119	487	Haeckel, "The History of Creation," vol. II. p. 346.
119	490	Dana, "Manual of Geology," p. 931.

OLIGOCENE PERIOD

122	33	Kayser, pp. 339, 340.
123	65	*Chæropotamus, Entelodon, Anthracotherium.*
124	73	*Cadurcotherium.*
124	75	*Palæochærus.*

NOTES

PAGE	LINE	
124	86	*Tetrabelodon augustidens.*
125	98	*Anoplotherium commune, cayluxense* and others.
125	102	*Cainotherium.*
125	120	*Eusmilus.*
126	123	*Ælurictis. Proælurus.*
126	130	*Stenoplesictis.*
126	132	*Canis Parisiensis,*
126	136	*Myoxus.*
126	137	*Sciurus.*
126	139	*Luctrictis Valetoni.*
126	140	*Cricetodon.*
126	141	*Protechinomys.*
126	142	*Neurogymnurus.*
126	144	*Sorex. Plesiosorex. Mysarachne.*
127	148	*Cebochærus.*
127	150	*Necrolemur.*
127	152	*Adapis.*
127	156	*Rana.*
127	165	*Agnopterus.*
127	166	*Ibidopsis.*
127	167	*Propelargus.*
127	172	*Palæocircus.*
130	240	*Leptomeryx, Hypertragulus, Hypisodus.*
130	242	*Agriochœrus, Oreodon, Eporeodon* and others.
130	245	*Didelphys.*
130	246	*Eumys.*
131	247	*Elotherium.*
131	253	*Leptaceratherium, Aceratherium, Metamynodon.*
131	263	*Dinictis.*
132	297	*Poebrotherium.*
133	305	*Cynodictis.*
133	306	*Amphicyon.*
133	307	*Cynodon, Dinictis, Nimravus* and others.

NOTES

PAGE	LINE	
133	310	*Steneofiber.*
133	312	*Hyopotamus.*
133	314	*Protoceras.*

MIOCENE PERIOD

135	1	For the geography of Europe at this time *see* Kayser, p. 353; Geikie, p. 1261; Jukes-Browne, p. 344.
137	62	*Cyperus.*
138	77	*Amphicyon.*
139	104	*Palæomeryx Feignouxi.*
139	105	*Dicroceros.*
139	114	*Protragoceros.*
139	118	*Tetrabelodon.*
139	120	*M. turicensis.*
140	141	*Aceratherium.*
140	142	*R. incisivus.*
140	143	*R. Schleiermacheri.*
141	149	*Macrotherium.*
141	157	*Hystrix.*
142	181	*Oreopithecus.*
142	190	*Pliopithecus, Dryopithecus. Hylobates.*
143	201	Dana, p. 881.
144	230	*Canis.*
144	233	Antelope *(cosoryx).*
144	234	*Dinictis, Machærodus, Pseudælurus, Stenogale* and others.
144	244	*Laopithecus.*
144	248	*Thinohyus.*
145	253	*Carioderma.*
145	262	*Blastomeryx.*
145	265	*Procamelis.*
146	281	*Aphelops.*
146	284	*Dicatherium.*

NOTES

PAGE	LINE	
146	296	*Hyrohippus.*
147	303	*Neohipparion.* There is an interesting article by Professor Henry Osborn on the Evolution of the Horse in "The Century Magazine" of November 1904.
147	325	*Squalodon.*
147	327	*Physeter.*
148	329	*Cetotherium cephalus.*
148	334	Dana, 932.
148	335	For an account of geographical changes in South America *see* "Encyclopædia Britannica" XXV. pp. 365 *et seq.*

PLIOCENE PERIOD

149	1	For the geography of Great Britain at this time *see* Jukes-Browne, "The Building of the British Isles," p. 535
150	25	Kayser, p. 362.
150	41-6	These warm climate plants have been found in fossil state near Lyons and in the valley of the Arno above Florence.
151	55	*Machærodus.*
151	57	*Promephitis. Mustela.*
152	74	*Cervus dicranoceros.*
152	77	*Cervus Matheroni.*
152	81	*Dremotherium.*
152	84	*Tragoceros, Palæotragus.*
152	86	*Palæoryx.*
152	89	*Gazella.*
152	93	*Helladotherium* (hornless, with molar teeth like the elk), *Samotherium* (horned, and with skull resembling that of the Antelope).
153	99	*R. incisivum.*
153	101	*R. pachygnathus.*
153	102	*R. bicornis.*

NOTES

PAGE	LINE	
153	106	*D. giganteum.*
153	117	*M. longirostris.*
153	121	*M. Borsoni.*
154	124	*Sus palæochærus.*
154	126	*S. antiquus, S. erymanthius.*
154	130	*Hipparion.*
154	140	*Equus.*
154	144	*Equus excelsus.*
155	156	*Mesopithecus. Dolichopithecus.*
157	219	*E. hysudricus.*
157	221	*Loxodon.*
158	227	*R. sivaleusis.*
158	229	*R. platyrhinus.*
158	233	*Anthracotherium silistrense.*
158	242	*Hippopotamus sivalensis.*
159	250	*S. falconeri, Sanitherium. S. titan.*
159	251	*S. hysudricus.*
159	252	*S. punjabiensis.*
159	253	*S. salvanius.*
159	255	*Palæomeryx.*
159	259	*Moschus.*
159	262	*C. duvancelli.*
159	272	*Hippotragus, Palæoryx.*
159	273	*Strepsiceros. Oreas.*
160	275	*Cobus. A. cervicapra*
160	276	*Alcelaphus.*
160	277	*Boselaphus.*
160	291	*Capra. Bison. Bos. Probubalos.*
160	292	*Ovis.*
160	296	*Equus.*
160	299	*Hipparion.*
161	300	*Tragulus, Dorcatherium.*
161	304	*Camelus.*
161	306	*Helladotherium.*

NOTES

PAGE	LINE	
161	313	*Sivatherium.*
161	320	*Nesocia. Rhizomys.*
161	323	*Lepus.*
161	324	*Hystrix.*
162	329	*Canis. Mustela. Ursus Theobaldi. Lutra.*
162	332	*Hyænodon.*
162	334	*Lepthyæna, Hyænictis, Hyæna.*
162	335	*H. Colvini.*
162	337	*Machærodus.*
162	341	*Felis cristata.*
162	342	Smaller forms of *F. cristata.*
162	343	*Mellivora.*
162	349	*G. gangeticus.*
162	350	*Rhamphosuchus.*
163	352	*C. palustris.*
163	355	*Bellia. Damonia*, and others.
163	358	*Colossochelys.*
163	360	*Clarias, Rita*, etc.
163	361	*Phalacrocorax.*
163	362	*Pelicanus.*
163	363	*Mergus.*
163	365	*Struthio.*
163	368	*Argala.*
163	375	*Semnopithecus.*
164	377	*Macacus. Cynocephalus.*
164	381	*Simia. Anthropopithecus.*
164	385	*Pithecanthropus.*
165	401	For geography of Great Britain at this time *see* Jukes-Browne, ch. XII. pp. 353 *et seq.*
166	440	*Astarte*, etc.
167	455	*Potamogeton. Menyanthes trifoliata. Nymphæa alba*, and *luteum.*
167	464	*Equus stenonis*, and *caballus.*
168	486	*H. amphibius.*

NOTES

PAGE	LINE	
168	489	*E. antiquus.*
168	490	*E. meridionalis.*
168	494	*R. etruscus*, and *megarhinus.*
168	500	*Capra.*
168	501	*Bos etruscus.*
168	502	*Ovibos moschatus.*
169	514	*Felis spelæa.*
170	549	*Macrauchenia.*
171	554	*Glyptodon, Dædicurus.*
171	557	*Megatherium Americanum, Mylodon.*
171	571	*Nototherium.*
171	572	*Macropus Titan.*
171	573	*Sarcophilus.*
171	574	*Phascolomys. Thylacoleo.*
171	576	*Canis dingo, Dasyurus.*
171	577	*Hydsiprimnus.*

QUATERNARY AGE

PLEISTOCENE PERIOD

EPOCH OF GREAT GLACIATION

181	205	J. Geikie, "The Great Ice Age," p. 545, quoting Maclaren.
181	210	J. Geikie, *ib.*, p. 543.
181	222	Wright, "Man and the Glacial Period," p. 133.
184	302	Boyd Dawkins, "Monograph of Pleistocene Mammalia."
185	308	*Betula nana. Salix polaris.*
185	310	*Bryum lacustre, Hypnum callichroum.*
185	317	*R. tichorhinus.*
185	318	*Ovibos moschatus. Cervus tarandus.*
185	319	*Canis lagopus. Myodes lemmus.*

NOTES

AN INTERGLACIAL EPOCH

PAGE	LINE	
188	27	*Ceratophyllum, Potamogeton.*
189	50	*Cervus capreolus.*
189	52	*Cervus elephus.*
189	58	*Cervus megaceros.*
189	67	*Felis spelæa.*
190	89	*See* Huxley, "Man's Place in Nature," ch. III. The skull here referred to is known as the Neanderthal skull.
191	121	Known as Palæolithic ("Old Stone") implements.

EPOCH OF GREAT RE-GLACIATION

196	52	For an account of the discovery of Mammoth remains *see* Hutchinson, "Extinct Monsters," ch. XIII.

FINAL RETREAT OF THE ICE

199	31	These are known as the Cave men.
199	36	For the physiography of the Mediterranean Sea in the Pleistocene Period *see* Boyd Dawkins, "Cave Hunting," p. 381.
199	45	These implements are classed with those termed "palæolithic."
202	119	The Engis and Cromagnon skulls have been referred to this time. *See* Boyd Dawkins, "Early Man in Britain," p. 224.
203	148	J. Geikie, "The Great Ice Age," pp. 488, 491.
204	155	As to the Belgium Caves, *see* Boyd Dawkins, "Cave Hunting," p. 347.
206	209	There has been much controversy on the question of the presence of Palæolithic men in North America. For a list of various and conflicting authorities on the subject *see* A. Geikie, "Text Book of Geology," p. 1361.

NOTES

MODERN PERIOD

PAGE	LINE	
211	118	Sharp, "Insecta" (Cambridge Natural History), p. 83.
212	139	Gadow, "Amphibia and Reptiles" (Cambridge Natural History), p. 279.
214	194	Neolithic or New Stone men.
215	216	Boyd Dawkins, "Early Man in Britain," pp. 310 *et seq.*
218	284	*ib.*, p. 233
218	296	*ib.*, pp. 315, 330.

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Wright, G. F., "Man and the Glacial Period."

Zittel, K. A. von, "Text Book of Palæontology."

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